

PCA II Pump
SERVICE MANUAL

PCA II PUMP SERVICE MANUAL REGISTRATION FORM

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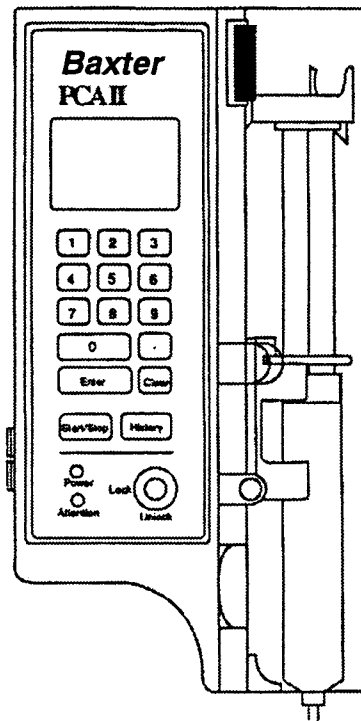
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PCA II Pump Service Manual



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A revision date for these instructions is included (at the bottom of this page) for the user's information. Refer to Appendix E for manual revision history. In the event that two years have elapsed between the most current revision date and product use, the user should contact Baxter Healthcare Corporation to see if additional product information is available.

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1.1 GENERAL

This Service Manual has been developed to introduce the Biomedical Technician to the PCA II Pump. This manual will provide a basic understanding of the internal workings of the Pump, functional test procedures, complete assembly/disassembly instructions, troubleshooting, and parts list.

NOTE

Except for the procedures and part replacements included in this document, no disassembly or repair should be attempted.

Baxter Healthcare provides a one-year limited warranty for each PCA II Pump. If a Pump requires warranty service, call Baxter Healthcare for repair. Unauthorized repairing of a Pump before the warranty has elapsed voids the warranty.

1.2 FACTORY SERVICE/ASSISTANCE

If factory service is desired, Pumps may be returned to Baxter Healthcare for repair.

To expedite repairs, call for a return authorization number before shipping any Pump to Baxter Healthcare.

1.2.1 *Technical Assistance, Service, and Repairs:*

For technical assistance, parts ordering, and service return authorization, contact the Baxter Healthcare Service Center:

1.2.2 *Parts and Service Related Business:*

1-800-343-0366

1.2.3 *Technical Repair Assistance Hotline:*

1-800-634-4602

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2.1 MECHANICAL ASSEMBLIES

2.1.1 Drive Mechanism Assembly

The drive mechanism assembly is held between the Pump case halves and includes the syringe holder (1), DC motor and gearbox (2), pusher block assembly (3), lead screw and gear assembly (4), mechanism circuit board (5) and various sensing systems (described later in this section under Sensing Elements and Circuits).

Fluid is delivered from the syringe by the action of the pusher block on the plunger of the syringe. The pusher block is advanced by the action of the lead screw on the half-nut in the pusher block assembly. The lead screw is turned by the DC motor through a gearbox integral with the motor and a pair of pinion gears, one welded to the gearbox shaft with the other attached to the lead screw. The Motor Drive Circuit provides control and delivery rate of the fluids and is described later in this chapter.

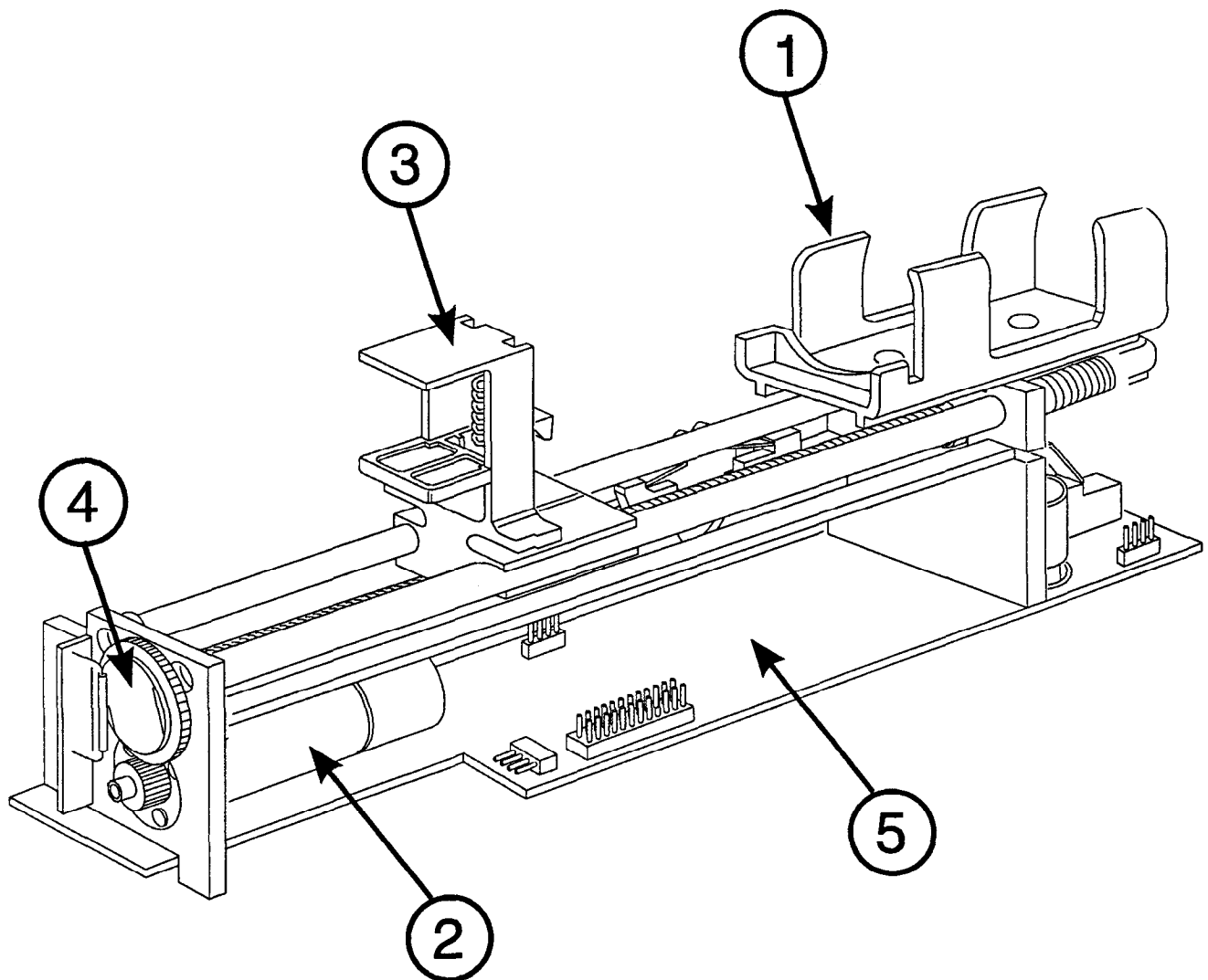


Figure 2-1 Drive Mechanism Assembly (out of case)

2.1.2 Pusher Block Assembly

The pusher block assembly is captured between the stainless steel guide rods (1) of the mechanism assembly. The pusher block extends through the opening between the case halves where it engages the plunger of the syringe. Squeezing the release lever (2) against the main support performs two functions. It allows the assembly to be moved freely up and down the guide rod by mechanically de-coupling the half-nut from the lead screw (3), and it disengages the pusher block assembly from the syringe plunger.

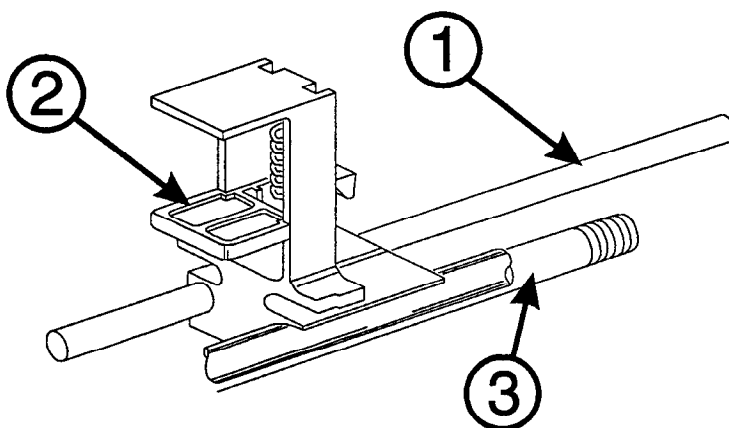


Figure 2-2 Pusher Block Assembly

2.1.3 Syringe Holder Assembly

The syringe holder assembly is connected to the drive assembly. It is designed to hold the Baxter® Prefilled 50 cc, BD 60 cc, or Monoject¹ 60 cc plastic syringes. Use of other syringes will result in incorrect delivery rates.

¹ Sherwood

2.2 ELECTRONIC CIRCUITS

2.2.1 Microprocessor and Associated Circuits

The MPU circuit board (1) is mounted on the inside of the front case cover on top of (and covers) the LCD display board (2). External switches, sensors, and inputs are provided to the MPU circuit board via direct connection and cabled input.

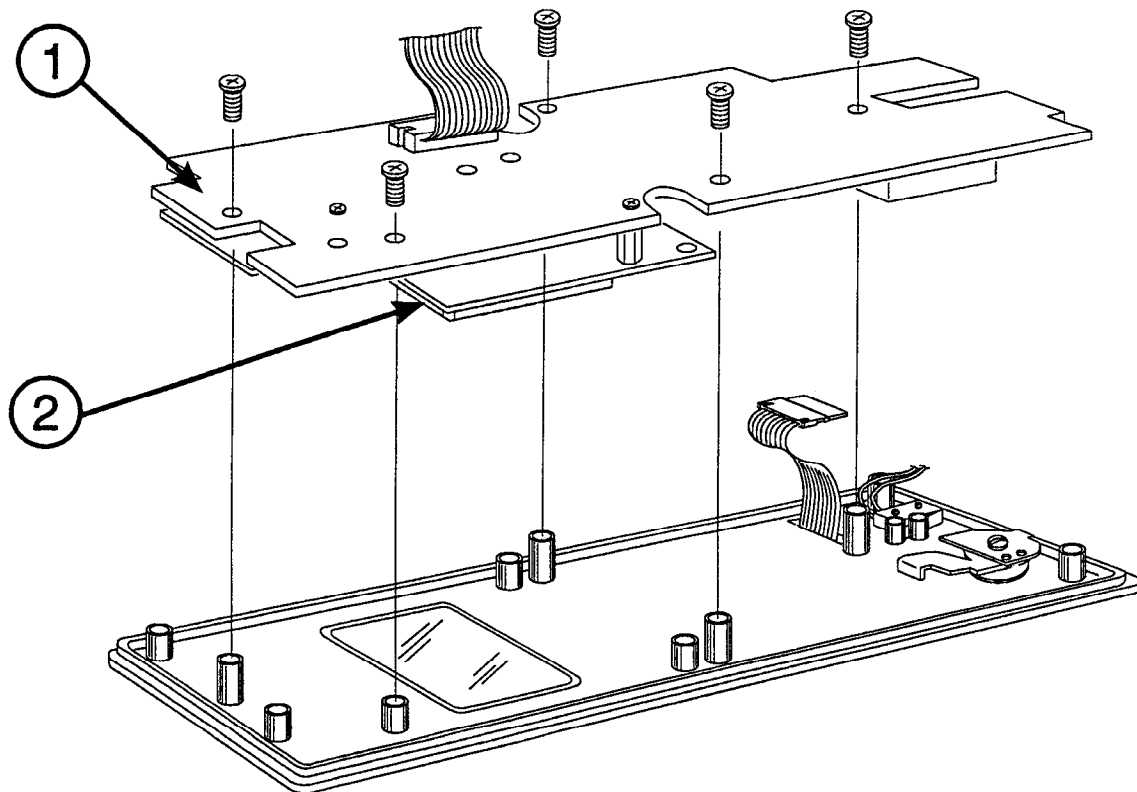


Figure 2-3 MPU Circuit Board Location

2.2.1.1 Microprocessor

The Motorola 68HC11A 1 microprocessor controls the functions of the Pump. It provides a high performance single-chip microcontroller with Electronic Erasable Programmable Read Only Memory (EEPROM), 16-bit timer, Serial Communication Interface (SCI), Serial Peripheral Interface (SPI), and an 8-bit Analog-to-Digital (A/D) converter. The 4 MHz crystal results in a 1 MHz E clock at pin 5.

The microprocessor controls the motor through ports PA3-PA6. It communicates through a buffer to the printer port. The MPU reads various analog signals through buffer U14. The bus interface of the MPU to system RAM U3, program cartridge (ROM), real-time clock U1, liquid crystal display (LCD) and quadrature decoder IC U6 is through buffers U18, 19 and U20. The custom IC U4 provides bus decoding and logic to interface the MPU to the keypad and sensors described later in this chapter.

At power up, the microprocessor conducts a number of Pump self-tests. Among these tests are; a check of the watchdog circuit to ensure that the functional program code is intact; test of RAM for full functionality; test of the A/D converter by sensing the voltage at PE3, pin 49 which ensures that the power supply is correct. If any of the self-tests fail, the microprocessor will halt and the audio alarm will sound continuously.

2.2.1.2 Custom Integrated Circuit

The custom IC U4 performs several functions. It generates the System Reset, provides physical memory mapping, provides additional digital I/O ports for the microprocessor and contains a watchdog circuit that will reset the microprocessor if the software fails to continually write to it at a predetermined time interval.

System Reset (RESET/, pin 43) can be asserted by several different sources. At power on, the charge time of C10 through R20 provides a period of delay where the system is held in reset through U4 pin 3, this allows the power supply voltage to stabilize before running the MPU. PWR_ERR/ is a signal that will cause a System Reset to occur if the over/under detector circuit senses that the power supply voltage is either above 6.0V or below 4.55V. Reset will also be asserted if the program cartridge is not installed or as previously described if a watchdog time-out occurs. RESET/ resets the microprocessor (disabling its output ports, including the motor drive signals), disables the motor through the SYSOK circuit, deselects all peripheral ICs and disables the custom ICs output ports as well. RESET/ also causes the buzzer to sound continuously acting through U2 and CR2.

Physical memory mapping is based on the address generated by the microprocessor and the R/W signal. Additionally, READ/ and WRITE/ strobes are generated to operate the ROM, RAM, and real time clock.

The digital I/O ports on the custom IC pass digital signals to and from the microprocessor. Most inputs are protected from static discharge by 100K ohm series resistors. IN00-03 and OUT00-03 are used to decode the front panel keypad in a matrix fashion. The mechanism sensors EOS/, 5ML/, and OCCL (inputs IN10-12) are used to trigger the End of Syringe, 5 mL and Occlusion alarms respectively. IN13 is used to detect closure of the patient switch and is debounced by RA13c and C6 as well as in software. OUT10 is used to activate the sensor for the door through Q4. OUT11 activates the display and, via Q3 and inverter T1, the electroluminescent backlighting. SYSOKCLK and OUT12 are part of the SYSOK circuit described later in this chapter. OUT20 and OUT21 activate the front panel Attention and Power LEDs, respectively.

The watchdog circuit is a safety feature designed to guard against loss of motor control in the event that software does not execute properly. It compares the 32 Hz clock provided by U12 to a write of a specific address by the microprocessor. If the two events are not properly synchronized, a system reset is generated.

2.2.2 RAM

8K bytes of system RAM are provided by U3 and an additional 256 bytes are located inside the microprocessor. U3 is powered from VRAM and continues to store data even when the Pump is turned off, and up to 20 minutes with the batteries removed. This allows for recalling and printing patient information even after the Pump has been turned off.

2.2.3 Program Cartridge (ROM)

The Program Cartridge contains the software code that operates the Pump. It is accessed via connector J15 on the MPU board. It has a capacity of 64K bytes. The custom IC allows access to most locations not used by other devices.

2.2.4 Real Time Clock

The real-time clock U1 provides data and time information to the microprocessor. It is powered by VRAM and continues to operate even when the Pump is turned off, and up to 20 minutes with the batteries removed.

2.2.5 SYSOK and Latching Reset Circuit

The System OK (SYSOK) and latching reset circuit performs several functions. It provides the SYSOK signal, a means to test the functionality of the watchdog circuit and a means to latch the RESET/ signal. The System OK (SYSOK) circuit prevents the microprocessor from driving the motor until several of the following events have taken place:

- 1) Power on reset has expired
- 2) The watchdog has been tested by allowing it to time out the first time the microprocessor is started at power up.

Unless both of the above events have occurred the SYSOK flip flop U9a will not go high signifying that the system has been properly initialized. The SYSOK signal U9a, pin 6 is gated with MPOWER to form the PWM signal which is used to drive the motor. As long as SYSOK is low, PWM is inhibited. Power On reset is used to initialize the circuit at power up. The Power On reset signal is further delayed by R23/C25 and inverted by U11 to form PWR_UP. PWR_UP keeps the SYSOK flip flops U9b and U15 cleared until power on reset has expired. The watchdog test is performed by purposefully causing the software not to service the watchdog if WDOG_TST is low (its initialized state after power up). Before the watchdog times out the microprocessor clocks U9 pin 9 high setting WDOG_TST high by manipulating OUT_12 and INSEL/. The watchdog will then time out resetting the microprocessor which then starts again. On the second start sequence the software sees that WDOG_TST is high and services the watchdog in the normal fashion. OUT_12 and INSEL/ are manipulated again which causes U15, pin 5 to clock high. This signifies that the watchdog test has successfully executed. Any additional resets at after this point will clock U15b thereby latching the RESET/ signal.

2.2.6 Motor Drive Circuit

The microprocessor controls the motor through three output ports: MENABLE, MBRAKE, and MPOWER. Primary motor motion feedback is provided by an encoder internal to the motor powered by microprocessor port MENCOD and monitored by quadrature decoder U6. Lead screw position feedback is provided through the REED input.

MENABLE is on (high) whenever the motor is active. Its primary function is to supply a ground path to run the motor. It has a secondary function in that its absence can disable operation of the motor in the event of the failure of the MPOWER signal or transistor.

MPOWER is a pulsatile signal which is AC coupled through C 17 and enabled by SYSOK through U8a on the MPU board. Renamed PWM, it passes to the Mechanism board where it controls the constant current driver transistor Q9. This in turn drives Q11, which provides power to the motor. In addition, the motor power is controlled by the normally closed occlusion switch SW1, which opens during an occlusion.

MBRAKE causes Q10 on the Mechanism board to short across the motor windings and halt the motor between pulses. It also provides braking action during bolus and dose delivery for better motor control.

The motor contains a 12 count quadrature encoder. Its outputs, ENCA and ENCB, are processed by the quadrature decoder U6 on the MPU board. The 15 kHz clock from U7, disabled by CTRRST when the motor is not moving to reduce power consumption, sets the digital filter frequency of U6. U6 contains a 12 bit counter that counts up or down depending on the phasing of ENCA and ENCB, and is monitored by the microprocessor through the address/data bus. The microprocessor periodically clears the counter via the ENCRST/ signal. The motor drive transistors Q8, Q9, and Q11 are tested at power on and then periodically while in operation to ensure that none are shorted. If this test fails, a system error alarm results.

2.2.7 Keypad

The front panel keypad is decoded in a matrix fashion by the microprocessor via the custom IC.

2.2.8 LCD Panel

The 64 x 84 dot matrix LCD panel is controlled by the microprocessor via the address / data bus. To conserve battery power, it is blanked using the DISPLAY output of the custom IC. DISPLAY also turns on Q3, which in turn powers voltage inverter T1, which excites the electroluminescent lamp that backlights the LCD.

2.2.9 Audible Alarm

The audible alarm is activated by either the AUDIO signal from microprocessor port pin 24 or by the system reset signal RESET/ through U2 and CR2. This ensures the alarm will sound if the watchdog times out.

2.2.10 Printer Output

The printer port uses the serial port within the microprocessor. All lines are buffered and have transient absorbers with series resistors to provide protection from electrostatic discharge. This serial port does not conform to RS-232, therefore, the Printer Adapter must be used if printer capability is desired.

2.2.11 Power Supply

The power supply consists of a switching regulator, a linear regulator and bypass FET, a charger battery relay and an on/off circuit. Each of these subsystems are located on the Mechanism Board (Figure 2-1).

2.2.12 Charger Circuit

A relay is used to switch between battery power and the AC wall charger power. When the AC adapter is plugged in, the relay switches closing the normally open connections between the AC adapter voltage and the power supply circuitry (VBATT_F). This also places a reverse biased diode in series with the positive battery input. This reverse biased diode prevents current from the AC charger from charging alkaline batteries. Charging current for NICAD batteries is provided through F2, CR11 and R222 to the charge ring of the battery stick. Reverse battery protection is provided by CR7 and F1. If batteries are installed in reverse, CR7 becomes forward biased and causes reverse current to open polyswitch F1.

2.2.13 On/Off Circuit

Input voltage from the Charger circuit VBATT_F is switched to the remainder of the power supply via FET Q1. U205, a linear regulator, provides a constant supply for RAM backup while the main power supply is switched off. C2 provides a short duration reservoir supply for RAM backup while the batteries are being, changed. Q1 is turned on when the On button is pressed inside the syringe cover. This applies the battery voltage to the gate of Q6 which provides a ground path for U2 turning it on. U2 provides a -5V signal to the source of Q13 turning it on which then turns on Q1. The presence of 5V at the cathode of CR4 keeps Q6 turned on thereby keeping the power supply turned on. Pressing the OFF button applies 5V to the gate of Q5 after a delay determined by R102/C9, which turns Q6 off. By reversing the turn-on process this turns the power supply off. The R102/C9 delay allows the microprocessor some time to shut down in response to XIRQ/ output from U2 pin 8.

2.2.14 Power Supply circuit

The switching regulator U1 is used to boost the input voltage when the battery voltage falls below 5V. When the batteries are fresh, power is supplied through diode CR1. As the battery voltage falls below 5V, the switching regulator takes over to maintain voltage at 5V. U202, a linear regulator, is used to keep the power supply output voltage at 5V when the switching regulator is not boosting voltage and the batteries are supplying more than 5V. FET Q201 is used to bypass the linear regulator when the switching regulator is on, to minimize the voltage drop when the linear regulator is not needed. Q201 can be turned on by either of two sources. REG_BYP is a signal from the MPU which turns on Q201 through Q204. The A/D converter within the MPU monitors the output of U1 via signal V_641 the software can then determine when to switch in and out U202. The second way Q201 can be turned on is by voltage detector U203. The AC adapter voltage CHG_MON is input to the voltage detector chip through a voltage divider network R212/R213. If the voltage at U203 pin 3 goes above 1.3V signifying that the AC adapter is in place the bypass FET Q201 is forced on. A second portion of U203 is used to monitor the battery voltage VBATTF. This is done through another voltage divider network R220/R221, and ensures that the power supply does not turn on automatically via C10 remaining charged and keeping Q6 on if the batteries are quickly removed and reinstalled. A diode voting network selects between sources of VRAM. The two diodes CR10 and CR9 ensure that the higher of the two supplies are used.

2.3 SENSING ELEMENTS AND CIRCUITS**2.3.1 Door Sensor**

The Pump senses that the door is closed by the proximity of a magnet imbedded in the door. This is done using a Hall effect switch mounted in the front case half. The output, DOOR, is read by the microprocessor at PE5, pin 46. To conserve battery power, the sensor is activated by the microprocessor via the HALLON/ signal only while it is being read.

2.3.2 Lock Sensor

The closure of the door lock on the front panel is sensed by a microswitch mounted to the back of the front panel. The signal is read by the microprocessor at PE7, pin 50. A transient absorber and series resistor are provided for protection from electrostatic discharge.

2.3.3 5 mL and End of Syringe Sensors

Two microswitches are mounted on a bracket attached to the mechanism assembly to sense the location of the pusher block assembly.

2.3.4 Occlusion Sensor

The syringe holder assembly attaches to the occlusion actuator block which is held in position by a spring and two preload collars. When the force on the syringe holder due to pressure in the fluid delivery system overcomes the actuator spring force, the occlusion actuator block begins to move and actuates the occlusion switch SW1 located on the mechanism board. The switch opens, removing power from the motor drive circuit and sending a signal OCCL to the microprocessor via Q3 on the mechanism board. When the pressure in the fluid system is released, the spring returns the actuator block to its normal position and the microswitch resets.

2.3.5 Syringe Plunger Capture Sensor

A hall effect switch located within the pusher block main support is biased 'on' by a magnet also located in the main support. If a syringe plunger is not captured under the pusher block finger lever, then a magnet located in the lever biases the hall effect switch 'off'. Correctly capturing a syringe plunger flange keeps the magnet in the lever away from the hall effect switch, allowing the switch to be biased 'on' in the main support. This information is passed to the microprocessor through the PBLOCK/ signal and is read at PE4, pin 44. This bias scheme ensures that the Pump will not operate if the sensor is not connected or if the connector or a wire fails.

2.3.6 Lead Screw Gear Sensor

A magnet on the lead screw gear activates a reed switch mounted above it. The resulting REED signal is read by the microprocessor at PA2, pin 32. The microprocessor continually checks the motion detected by this sensor against the motion detected by the primary motor encoder. If this does not agree, then a system error alarm occurs.

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3.1 GENERAL

This chapter contains the information necessary to perform an initial inspection and set up of the PCA II Pump. A functional test is included in Chapter 4 to determine if operation is satisfactory.

3.2 INITIAL INSPECTION AND DAMAGE CHECK

The PCA II Pump has been thoroughly tested and inspected at the factory prior to shipment and has been found to comply to Baxter's electrical and mechanical standards. However, abusive handling during shipment may cause either visible or hidden damage. Follow the instructions in this section before performing operational checks.

If any damage is observed in any of the following inspections, and this damage is related to shipping, notify the carrier's agent immediately. Do not return the damaged equipment to the factory without written authorization.

3.3 INSPECTIONS

1. Carefully inspect the shipping carton before opening it. Note any obvious damage caused by mishandling and record any such damage.
2. The carton should contain the following:
 - One PCA II Pump
 - One Locking Pole Clamp
 - One Patient Control Button
 - One Operators Manual and Quick Reference Guide
 - Two Keys
 - Two Screws to Optionally Mount Pole Clamp to Pump
3. Remove the Pump from the carton. Place the Pump on a flat surface and perform these visual inspections:
 - A. Check the entire surface for chips, scratches, dents, or cracks
 - B. Check the front panel for damage to the membrane switch (such as peeling).
 - C. Peel off the plastic protective covering from the syringe cover.
 - D. Check the syringe cover for cracks and check to see that it locks properly.
 - E. Turn the Pump over and verify that the serial number matches that on the shipping carton.

4. Remove the pole clamp from the carton and check the following:
 - A. The lock operates smoothly.
 - B. When unlocked, the knob turns freely in both directions.
 - C. When locked, the knob turns clockwise but not counterclockwise

The Pump design includes extensive self-check procedures which continually monitor the Pump's operation. The user is usually unaware that these checks are being performed. If a fault condition is detected, the appropriate visual and audible alarms are triggered. Pump operation is halted until the error is corrected.

It is recommended that the following characteristics of the Pump be tested. Each of the tests listed below are described in detail later in this chapter. Prior to beginning any test, ensure batteries are installed properly (i.e. correct polarity).

- Power-up - (4.1)
- Attention Light - (4.2)
- Pusher Block - (4.3)
- Syringe Holder - (4.4)
- Occlusion Sensing - (4.5)
- 5 mL Alarm - (4.6)
- End of Syringe Alarm - (4.7)
- Flow Rates and Delivery Volumes - (4.8)
- AC Power Kit (Optional) - (4.9)

NOTE

Make sure that a cartridge is installed in the Pump before starting the tests.

NOTE

The following instructions are for use with the Multi-Mode Cartridge (P/N 6464545) only! Please contact the Baxter Service Department if this cartridge is not available.

NOTE

If a Pump fails the initial test, repeat the test. If the Pump still fails the test, call a Baxter representative for a service authorization number and the procedure for returning a Pump for repair.

NOTE

If using the optional AC Power Kit, all tests must be performed with the power pack plugged into a 120V AC outlet.

4.1 POWER-UP

Press the On button. The audio alarm will beep and be followed by a self test message on the display. If an error message appears, perform the following corrective action:

- Press the off button to turn the Pump off.
- Check to make sure the cartridge is properly seated in its slot.
- Press the On button.
- If a system error alarm appears, record the error number, (or, if the Pump beeps continuously with no message, turn the Pump OFF and repeat the test by turning the Pump ON again).
- If the failure recurs, the Pump requires service.

4.2 ATTENTION LIGHT

Push and turn the key to "Unlock" and open the syringe cover. The red light should flash whenever the key is in the unlocked position, a prescription has been entered and is not running, or the syringe cover is open.

- If a system error alarm appears, record the error number, turn the Pump OFF and repeat the test by turning the Pump ON again.
- If the failure recurs, the Pump requires service.

4.3 PUSHER BLOCK

Squeeze the release lever of the pusher block and check for free movement of the pusher block over the complete travel. Release the lever and ensure that the pusher block assembly reengages with the lead screw (should not move freely). The anti-siphon latch of the pusher block captures the syringe plunger to prevent siphoning. Also perform the following to verify correct operation:

1. Insert syringe in Pump, but do not connect pusher block to syringe plunger.
2. Press "Enter".
3. The pusher block not connected message should appear.
4. Slide the release lever down until it snugly meets the top of the syringe plunger flange.

5. Release the lever to engage the anti-siphon latch under the syringe plunger flange.
6. Close and lock the cover then press "Clear".
7. Enter and verify a prescription.
8. Press START. The Pump should begin running the entered prescription.
9. If a problem occurs, return the Pump for service.

4.4 SYRINGE HOLDER

Check the holding ability of the syringe holder. Ensure that a 60 cc plastic syringe (B-D Plastipak² or Sherwood Monoject only) or a Baxter® 50 cc prefilled syringe sits firmly in the holder. The syringe barrel flange must be placed in the slot of the holder. If a problem occurs perform the following:

- Make sure that a proper syringe is being used.
- If the failure can not be corrected, return the Pump for service.

4.5 OCCLUSION SENSING

The Occlusion Halt message appears on the screen, the red Attention light flashes, and the alarm sounds. Perform the Occlusion sensing test as follows:

1. Push and turn the key to the UNLOCK position.
2. Open the syringe cover.
3. Press the On button.
4. Fill a syringe with 10 mL of water and attach a Baxter® tubing set to the end of a syringe.
5. Install the syringe and tubing set in the Pump and close the cover.
6. Press [3] to select the Continuous Infusion Mode.
7. Select mL.
8. Program a rate of 99 mL/hr and an amount of 10 mL.
9. Press the START/STOP button.

10. Fluid should begin flowing from the end of the tubing set.

11. Clamp the tubing set near the tip of the syringe.

12. Within 3 minutes the following should occur:

- the occlusion message appears on the display.
- the red Attention light flashes, and
- the alarm sounds.

13. Remove the clamp.

14. Continue to the 5 mL, alarm test.

4.6 5 ML ALARM

Check the operation of the alarm by following the procedure below:

1. Press the START button to resume the already programmed continuous infusion. If you are not continuing a previous program, refer to paragraph 4.5 step 1-9 for initial set up.
2. When there is approximately 4-6 mL remaining in the syringe, the following should occur:
 - The 5 mL remaining message appears on the display
 - The red Attention light flashes, and
 - the alarm sounds.
3. Press the CLEAR button and continue to the End of syringe alarm test.

4.7 END OF SYRINGE ALARM

Check the operation of the alarm by following the procedure below:

1. This test is a continuation of the 5 mL left alarm of paragraph 4.6. When the syringe is empty the following should occur:
 - The end of Syringe message appears on the display,
 - The red Attention light flashes, and
 - The alarm sounds.
2. Ensure that the syringe contains 2 mL or less of fluid.

4.8 FLOW RATES AND DELIVERY VOLUMES

To check rates and volumes, Baxter Healthcare recommends the use of a distance gauge calibrated in 0.001 inch increments. For details, refer to the Accuracy Test Kit, Catalog no. 6464460). If necessary, the following method of using a 10 mL, 0.05 mL/div burette and stopwatch may be substituted.

1. Fill a 60 cc syringe with water and install it in the Pump.
2. Turn the Pump power ON.
3. Prime the system to eliminate all air from the fluid path.
4. Connect the burette to the tubing set.
5. Prime until water is at 0 mL level in the burette.
6. Close and LOCK the syringe cover.
7. Press [3] for continuous infusion mode.
8. Press [1] for mL.
9. Program the following:
 - a rate of 20 mL/hour
 - an amount of 5 mL
 - no KVO
10. Press the START/STOP button on the Pump and start the stopwatch simultaneously.
11. When the infusion is complete stop the timer. The time required should be 15 minutes ± 27 seconds ($\pm 3\%$). The actual volume delivered should be 5 mL ± 0.15 mL ($\pm 3\%$).

4.9 AC POWER KIT (OPTIONAL)

The display flashes "Battery Power" when the Pump is operating on rechargeable batteries. Perform the following to verify that this occurs:

1. Disconnect the power pack from the Pump.
2. After a short delay, verify "Battery Power" is now flashing on the display.
3. If the display does not change, check to see that rechargeable batteries are being used and that they are properly installed.
4. Reconnect the power pack and verify that the display no longer flashes "Battery Power".

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5.1 General

The Pump is designed to provide reliable service with only minor routine maintenance. A periodic functional inspection of the Pump should be made at least every six months to assure proper operation. The Pump should be cleaned and disinfected if necessary, according to frequency of use and hospital protocol.

5-2 Cleaning and Disinfecting

The exterior surfaces may be cleaned using a cloth dampened with water or a mild detergent, then wiped dry. A mild germicide may be used as a disinfectant. Vestal LPH or equivalent is recommended

CAUTION

The PCA II Pump is not liquid proof and must not be immersed in liquid. Avoid getting liquids inside the Pump or permanent damage to the Pump may result. Do not use alcohol for cleaning. Sterilization by ETO, steam, etc., should not be attempted.

5.3 Lubrication

The lead screw should be lubricated once every six months using Versilube³ G-322L grease. Using the nozzle applicator supplied with the grease, squeeze a small amount on the entire length of the lead screw. Apply grease by carefully inserting the nozzle straight into the case channel thereby spreading the rubber seal. Use care to avoid damaging the seal. Figure 5-1 displays the syringe mechanism removed from the Pump to illustrate lead screw location. The assembly does not need to be removed to apply lubrication.

CAUTION

Use only the recommended lubricant. A substitute lubricant may cause permanent damage.

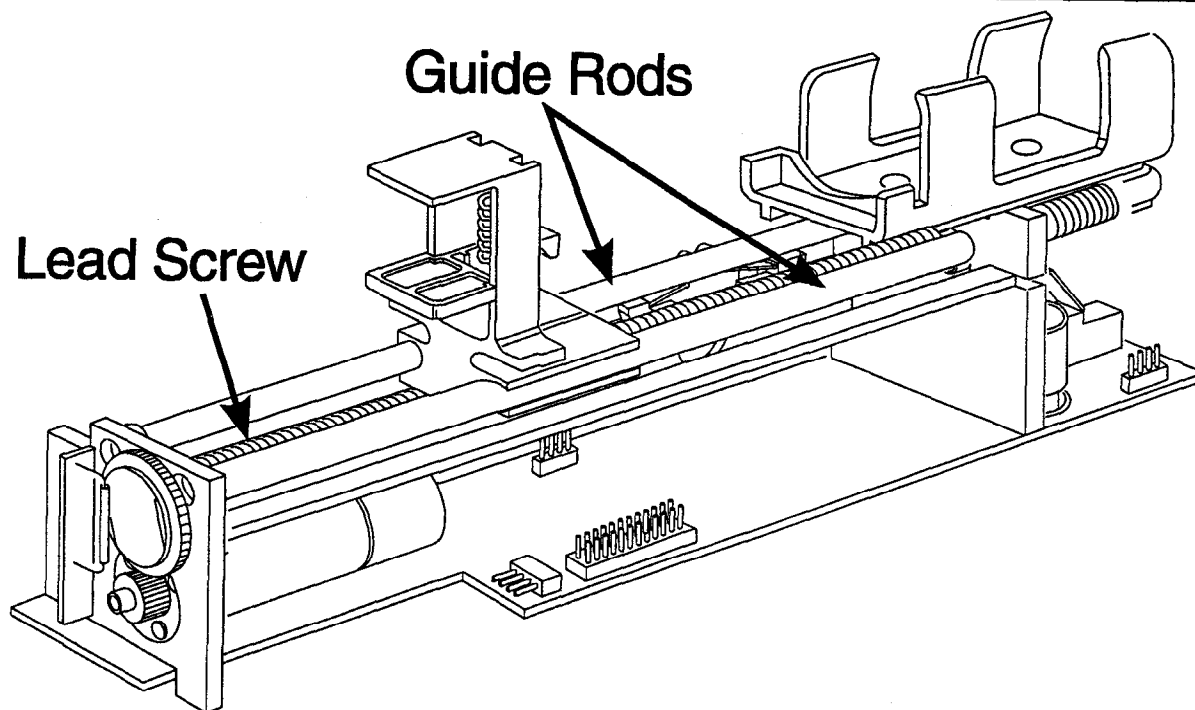


Figure 5-1 Syringe Mechanism

6.1 GENERAL

Pumps under warranty must be returned to the factory for troubleshooting and repair. Unauthorized disassembly/repair will void your warranty. When a Pump is malfunctioning, perform the following to see if Pump operation can be restored. Ensure that the:

- program cartridge is properly seated.
- batteries are installed and not depleted.
- batteries are installed correctly (proper polarity).
- patient control switch is properly installed.
- pusher block is properly engaged on the syringe.

If this does not restore the Pump to operation refer to the troubleshooting chart later in this chapter.

WARNING

There are no internal user repairable parts available. The Pump must only be serviced by a trained biomedical engineering technician or Baxter Healthcare personnel.

6.2 TROUBLESHOOTING

The troubleshooting procedure and tables in this section are written for repair to the board level. Except for those items listed, circuit board components are not available from Baxter Healthcare. Refer to Chapter 7 for disassembly procedures and Appendix C for part information.

6.2.1 Board Exchange

A board exchange program is available for most circuit boards in the PCA II Pump. Baxter Healthcare provides a refurbished board in exchange for a returned defective board. Boards which are damaged through unauthorized rework, missing components, or improper maintenance will not be eligible for this program. Call for an authorization number prior to shipping the defective board.

6.2.2 Tools and Equipment

The following list of tools are recommended for use in maintaining and troubleshooting the PCA II Pump. The troubleshooting chart assumes that these tools or their equivalent are available for use.

- Oscilloscope
- Screwdriver (Cross point)
- Needle nose Pliers
- Soldering Iron
- Loctite 414 Adhesive
- Tubing Set
- 10 mL, 0.05 mL/div burette with stand
- Non-vented luer lockcap or tubing set clamp.
- 6 Volt Power Supply
- Wire Cutters
- 7/16" Open End Wrench
- Digital Voltmeter
- ESD Protection Station
- 60 cc Syringe (B-D or Sherwood Monojet)
- Stopwatch or timer (minutes and seconds)

6.2.3 Troubleshooting Tips

- It is helpful to use a 6 Volt power supply when servicing a disassembled Pump. Ensure that correct polarity is observed before applying power to the unit.
- Operation of the syringe door can be simulated by shorting pins 1 and 3 of connection J10 located on the MPU board. Shorting pins 1 and 3 simulates the door being closed.

Table 6-1 Troubleshooting Chart

Symptom	Possible Cause	Solution
No Power	Dead Battery	Check/Replace batteries
	Blown Fuse	Check/Replace fuse (located under mounting plate).
	Bad battery terminal connection or wires	Inspect/repair the battery terminals and/or wires.
	ON/OFF Switch	With the power disconnected, check the continuity between pins 1 and 2 of J1 connector while depressing the "ON" button. If circuit remains open, replace the ON/OFF keypad.
	Defective Mechanism Board	Replace the mechanism board.

Symptom	Possible Cause	Solution
Unit will not turn off	ON/OFF Switch	With the power disconnected, check the continuity between pins 3 and 4 of J1 connector while depressing the "ON" button. If circuit remains open, replace the ON/OFF keypad.
	Defective Mechanism Board	Replace the mechanism board.
No audio alarm, visual alarm OK	Buzzer	With Pump in alarm condition, check the collector of Q7 on the mechanism board with a scope for a negative going pulse. If present, replace buzzer.
	Defective MPU Board	Check pin 12 of J2 on the mechanism board for a positive going pulse. If missing, replace MPU board.
	Defective Mechanism Board	Replace the mechanism board.
5 mL and/or EOS alarm inoperative	Defective microswitch	Check/replace microswitch
	Pusher block assembly	Check if the actuator on the pusher block is intact and making contact with the microswitch. Replace the pusher block or align the switch assembly as necessary.
	Wiring and connectors	Inspect/repair as necessary.
	Defective MPU board	Replace MPU board.
Occlusion Alarm inoperative	Defective microswitch	Check/replace microswitch
	End block	Ensure that the actuator on the end block is tripping the switch on the mechanism board.
	Defective Mechanism Board	Replace the mechanism board.

Symptom	Possible Cause	Solution
LCD not working or missing pixel(s)	Defective LCD	Replace LCD.
	Defective MPU board	Replace MPU board.
Unit will not infuse	Defective pusher block	If lead screw is turning and pusher block is not moving, replace pusher block.
	Defective motor	Replace motor.
	Defective mechanism board	Replace mechanism board
	Defective MPU board	Replace MPU board.
Inaccurate flow rate	Wear of pumping mechanism	Clean/lubricate lead screw and re-test.
	Worn half-nut	Inspect/replace pusher block assembly.
Display shows "UNL" when syringe cover is closed and locked.	Defective key switch	Check/replace microswitch
	Loose/missing cam	Check lock cam for switch actuation, adjust as needed.
	Defective/missing magnet	Replace syringe cover assembly.
	Defective Hall effect sensor	Perform the syringe cover simulator procedure as described in section 6.2.3, if this procedure causes the display to indicate normally, replace the Hall effect sensor.
No input from front panel keypad	Defective keypad	With power removed, check keypad for continuity while pressing the suspected key (refer to schematic for pinout). If circuit remains open, replace keypad.
	Defective MPU board	Replace MPU board.

NOTE

If an error code should appear, remove all power and restart the Pump. A problem is indicated if the alarm persists. Due to the fact that error codes shutdown the unit, it is difficult to troubleshoot without swapping out suspected assemblies. As all error codes are software generated, the software cartridge and the MPU board are always suspect. For a complete explanation of the error codes refer to 6.2.4.

E10, E11, E14, E15, E17, E39, E40, E50, E51, E52, E53, E54, E70, E71, E72, E80, E81, E82, E83, E84, E85, E86, E87, E88, E90, E91, E92, E93, E94, E95, E96, E97	Defective software cartridge or MPU board.	Replace software cartridge or MPU board.
E33, E34, E37	Defective/Misaligned Reed Switch Assembly	Adjust/replace reed switch.
E60, E61, E62, E63	Defective mechanism board	Replace mechanism board.
E13, E64	Defective MPU board.	Replace MPU board.
E30, E31, E32	Defective motor	Replace motor
E12	Defective 5 mL switch	Adjust/Replace 5 mL switch.
E13	Defective/Missing magnet or defective hall effect sensor.	Check Hall effect sensor as described in section 6.2.3.
E16	Defective LED	Check/replace LED(s)
E01-E09, E18-E29, E41-E49, E55-E59 E65-E69, E73-E79	NOT USED	

6.2.4 System Error Codes

Below is a listing of all error codes that the PCA II Pump can generate. Refer to the Troubleshooting Chart (Table 6-1) for corrective action should one of these alarms occur. This list is provided for reference purposes only.

CODE	Description
E01-E09	Not used
E10	Keypad button held down more than 2 minutes
E11	PCA button held down more than 2 minutes
E12	EOS on without 5 mL switch activated
E13	Illegal open door occurred
E14	Analog to digital converter busy flag time-out
E15	Display controller busy flag time-out
E16	Voltage error during LED test
E17	Unable to get stable reading from decoder
E18-E29	Not used
E30	No motor encoder counts after several motor pulses
E31	Motor pulse width below minimum
E32	Motor pulse width above maximum
E33	Lead screw comparison error, +25%
E34	Lead screw comparison error, -25%
E35	Too many motor counts received, +3%
E36	Too few motor counts received, -3%
E37	Lead screw counts received when motor should be stopped
E38	Motor counts received when motor should be stopped
E39	Motor drive circuit failure
E40	Motor disable circuit failure
E41-E49	Not used
E50	Clock comparison error
E51	Bad data received from RTC chip
E52	Real Time Clock chip is running too fast
E53	Incorrect time data received from RTC chip
E54	Unable to write data to RTC chip
E55-E59	Not used
E60	Regulated voltage over upper limit
E61	Regulated voltage below lower limit
E62	Charge ring detect failure
E63	Charge insertion detection failure
E64	No detectable power source
E65-69	Not used
E70	OPTION register data verification error
E71	MPU set to test mode
E72	CONFIG register data verification error

CODE	Description
E73-E79	Not Used
E80	Stack overflow
E81	Invalid Rx entry step
E82	Keypad buffer overflow
E83	Unused screen error
E84	Interrupts illegally disabled
E85	Software COP error
E86	System volume out of range
E87	System rate out of range
E88	Total injected has exceeded maximum
E89	Not used
E90	Screen index error
E91	History checksum failure; History data corrupt
E92	Rx data cannot be retrieved
E93	A critical variable has been corrupted
E94	Rx data checksum failure
E95	Hardware revision does not match with its complement
E96	An error detection variable has been corrupted
E97	Motor save variable has been corrupted

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7.1 GENERAL

This chapter contains a detailed description of the disassembly and assembly procedure for the PCA II Pump. Contact Baxter Healthcare if you have any questions while servicing the PCA II Pump.

CAUTION

When performing the procedures of this chapter, exercise extreme caution during disassembly to protect the circuit boards from static discharge. The inspection or repair station, all equipment, and personnel should be properly grounded.

NOTE

During disassembly, note the orientation and routing of all cables and connectors. Failure to do so may result in improper operation and/or damage to the Pump upon reassembly.

NOTE

After a component is reassembled it must be aligned or adjusted per the procedure listed as its retest requirement.

NOTE

All Pumps must pass the functional tests in chapter 4 after repair is complete.

7.2 DISASSEMBLY PROCEDURES

The procedure to assemble a component is the reverse of the disassembly unless otherwise noted. A complete assembly procedure for the mechanism assembly is provided in section 7.3.

Numbers in parenthesis refer to the numbered parts of the drawing associated with the procedure.

Prior to disassembly, remove all accessories, batteries, and the software cartridge.

7.2.1 Syringe Cover

1. Unlock and open the syringe cover (1).
2. Remove the 4 pan head screws (2) and lock washers (3). Save the screws and lock washers for use during assembly.

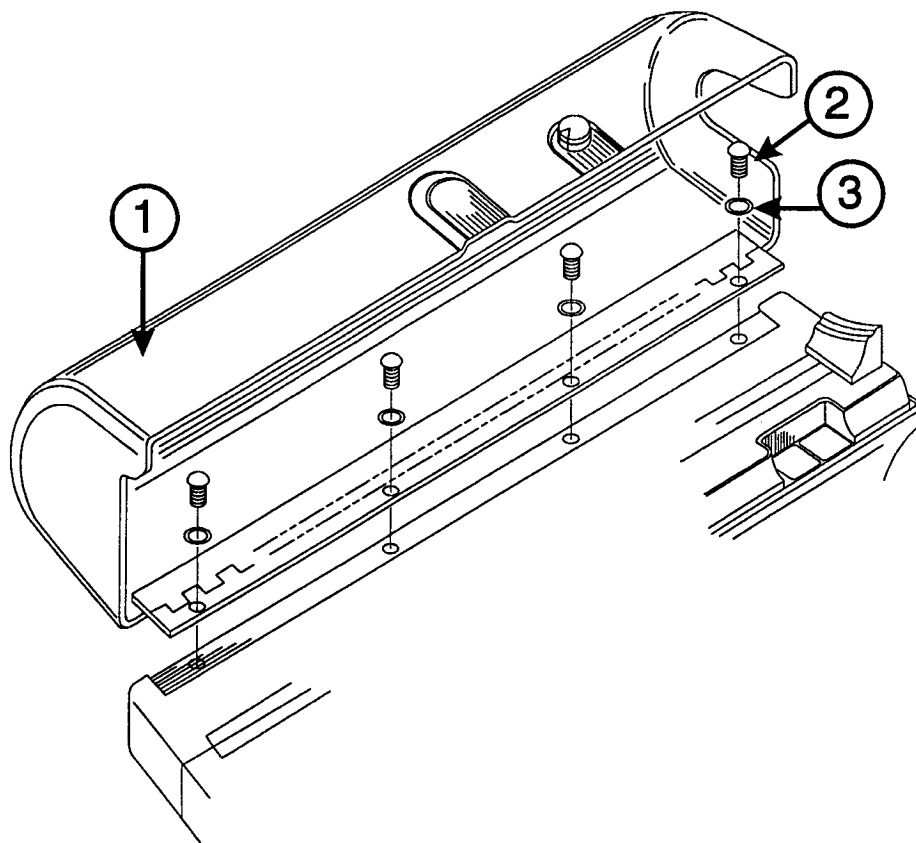


Figure 7-1 Syringe Cover Removal

7.2.2 Rear Case Half Assembly

1. Place the Pump face down on a flat clean surface.
2. Remove the 5, screws (2) from the rear case half (1).
3. Gently pull the rear case half from the rest of the Pump assembly.

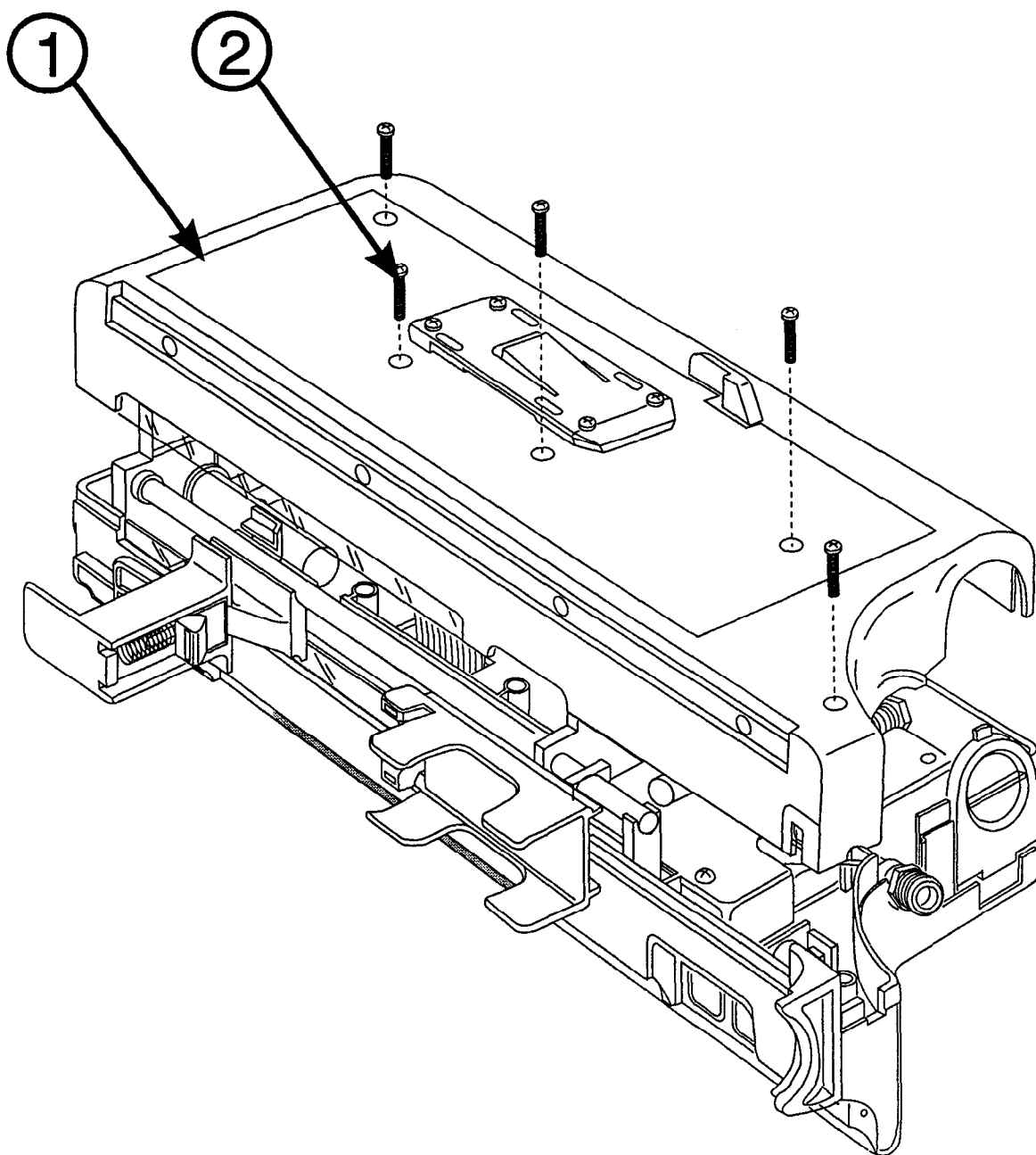


Figure 7-2 Rear Case Half

7.2.3 Battery Door Assembly

1. Remove the rear case half by following the procedure in section 7.2.2.
2. Disconnect the battery five pin connector J3 (1) from the mechanism board. Remove the red wire from the connector assembly by lifting up the plastic retainer (a) and sliding the wire (b) out of the connector.
3. Cut the tie wraps (2).
4. Remove the door keeper (3). The keeper is secured in place with Loctite 414 adhesive. When replacing the keeper apply a thin coating of Loctite 414 adhesive to secure the keeper in place.
5. Remove the battery door (4).

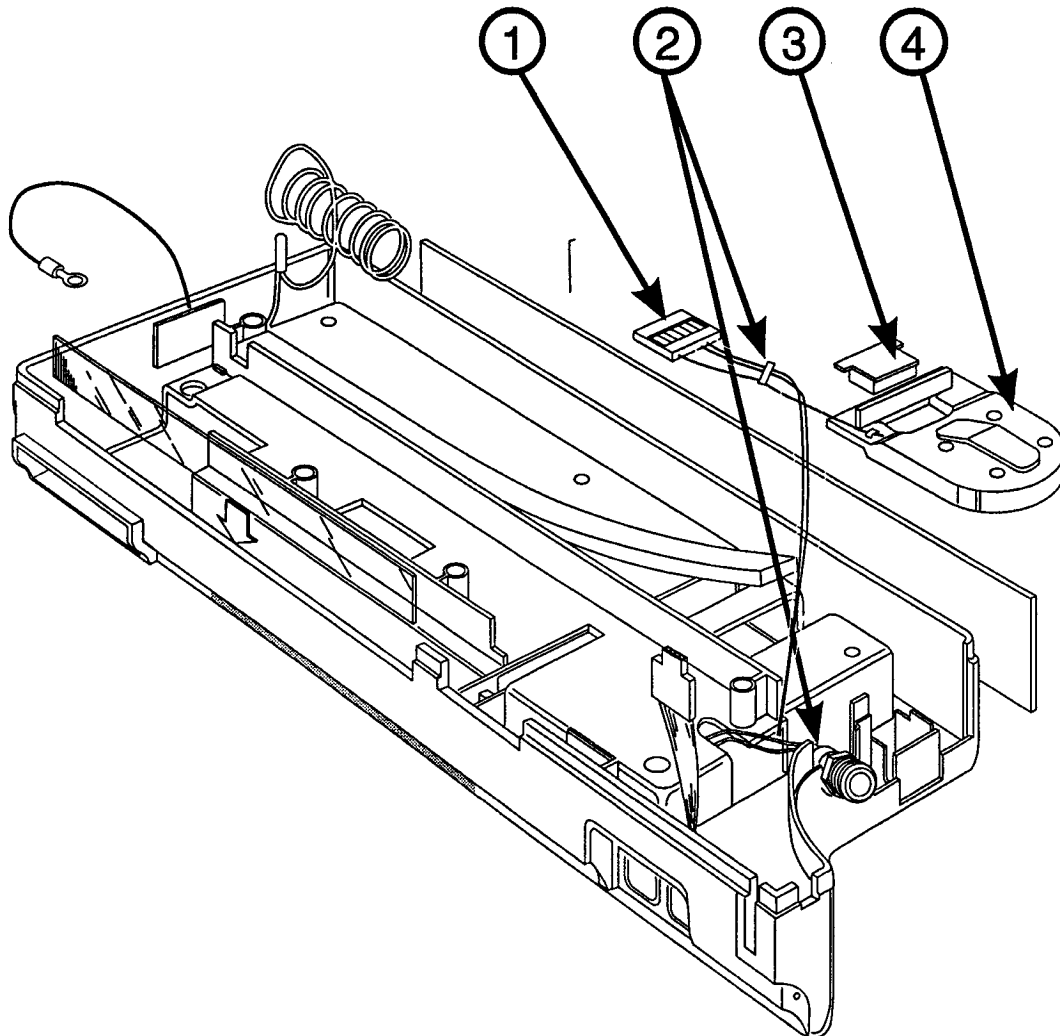
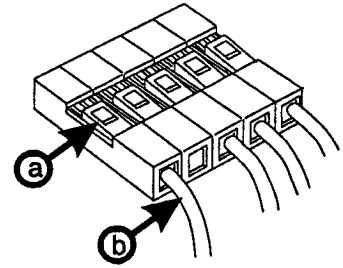


Figure 7-3 Battery Door Assembly Removal

7.2.4 Mechanism Assembly

1. Remove the rear case half assembly by following the procedure of section 7.2.2.
2. Locate and remove cable connection to J3 (1). J3 not shown in Figure 7-4, connection is behind the microswitch. Disconnect cable from J1 (2). Connection identifications are also noted on the board.
3. Partially lift the mechanism out of the case and disconnect the ribbon cable at J2 (3).
4. Lift the mechanism clear of the Pump case.

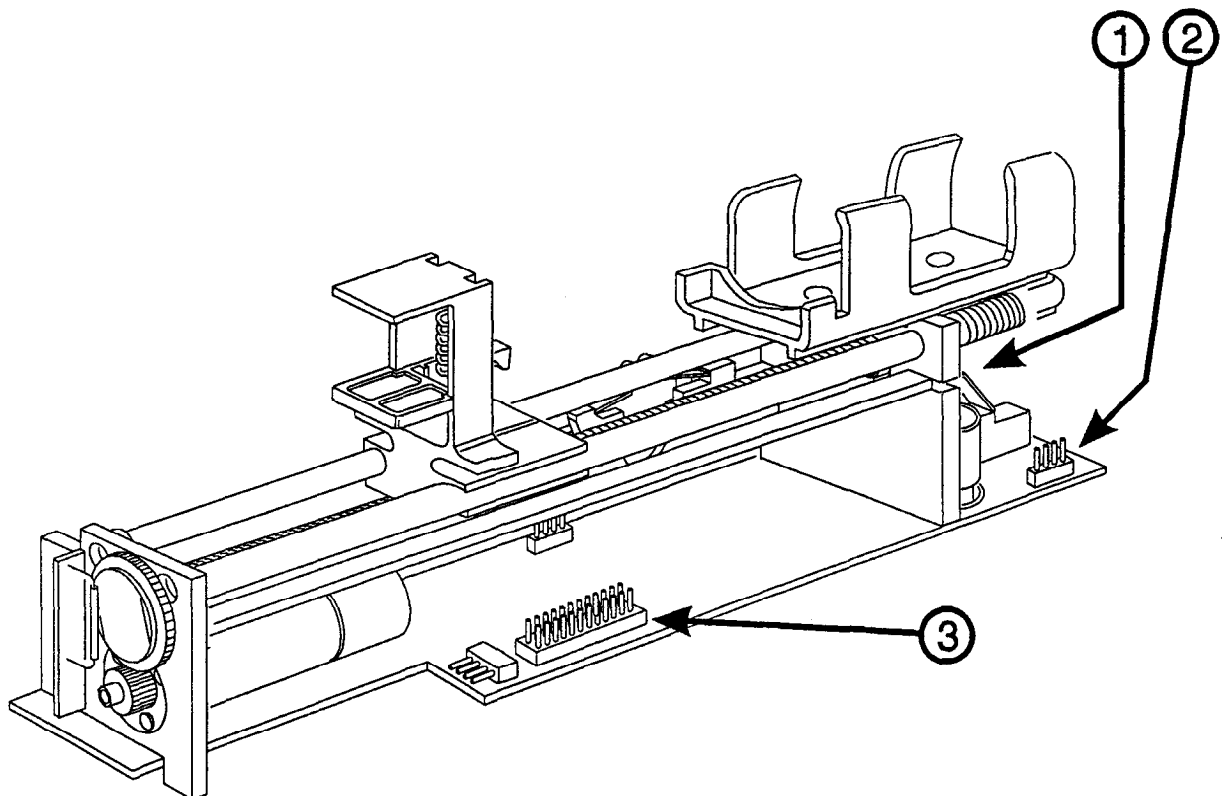


Figure 7-4 Mechanism Assembly (Removed From Case)

7.2.5 Front Switch Plate Assembly

1. Perform the following procedure before trying to remove the front switch plate assembly:
 - a) Remove the rear case half assembly using the procedure of section 7.2.2.
 - b) Remove the mechanism assembly using the procedures of section 7.2.4.
2. Remove the 6 screws (1) that secure the front case (2) half to the Pump housing. Note that there are three different lengths of screws.
3. Partially remove the switch plate assembly. Disconnect the cables at J10 (3) and J14 (4) from the MPU. Carefully lift the Pump housing off of the front Switch Plate Assembly being careful to thread the ribbon cable through the Pump housing opening.

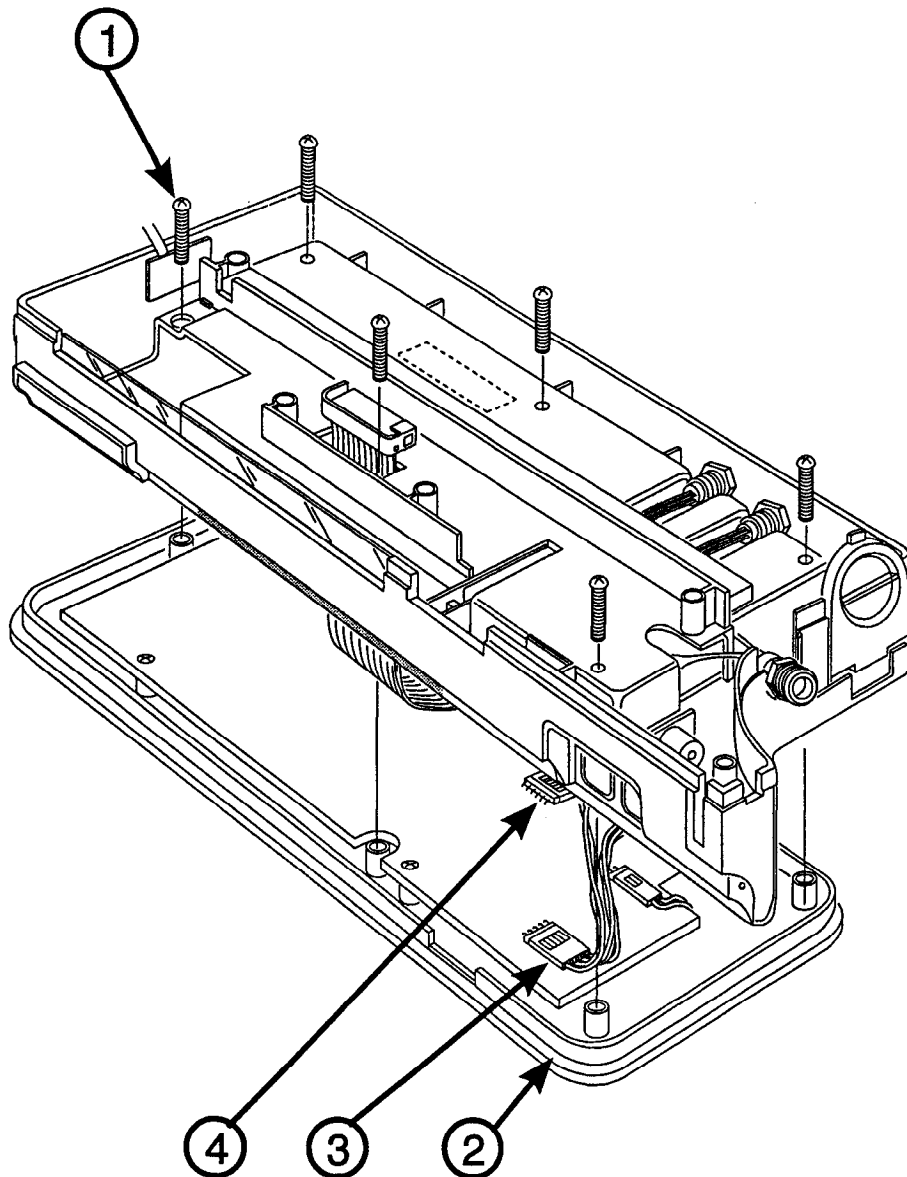
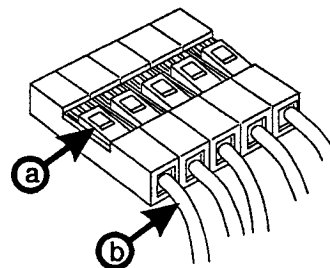


Figure 7-6 Front Switch Plate Assembly

7.2.6 Patient Control Connector

1. Perform the following procedure before trying to remove the patient control connector:
 - a) Remove the rear case half assembly using the procedure of section 7.2.2.
 - b) Remove the mechanism assembly using the procedures of section 7.2.4.
 - c) Remove the front switch plate assembly using the procedures of section 7.2.5.

2. During the front switch plate removal, J10 (2) was disconnected from the MPU. J10 has the wires that go to the patient connector. Pull this connector up through the Pump housing to disconnect the patient connector wires. Remove the yellow and brown wires from the connector assembly by lifting up the plastic retainer (a) for each wire (b) and sliding the wire out of the connector.



3. Cut the tie wrap.
4. Loosen the nut that holds the patient connector (1) to the case. The connector is secured in place with Loctite 414 adhesive. Gently pry the connector out of the case. When replacing the connector apply a thin coating of Loctite 414 adhesive to secure it in place.

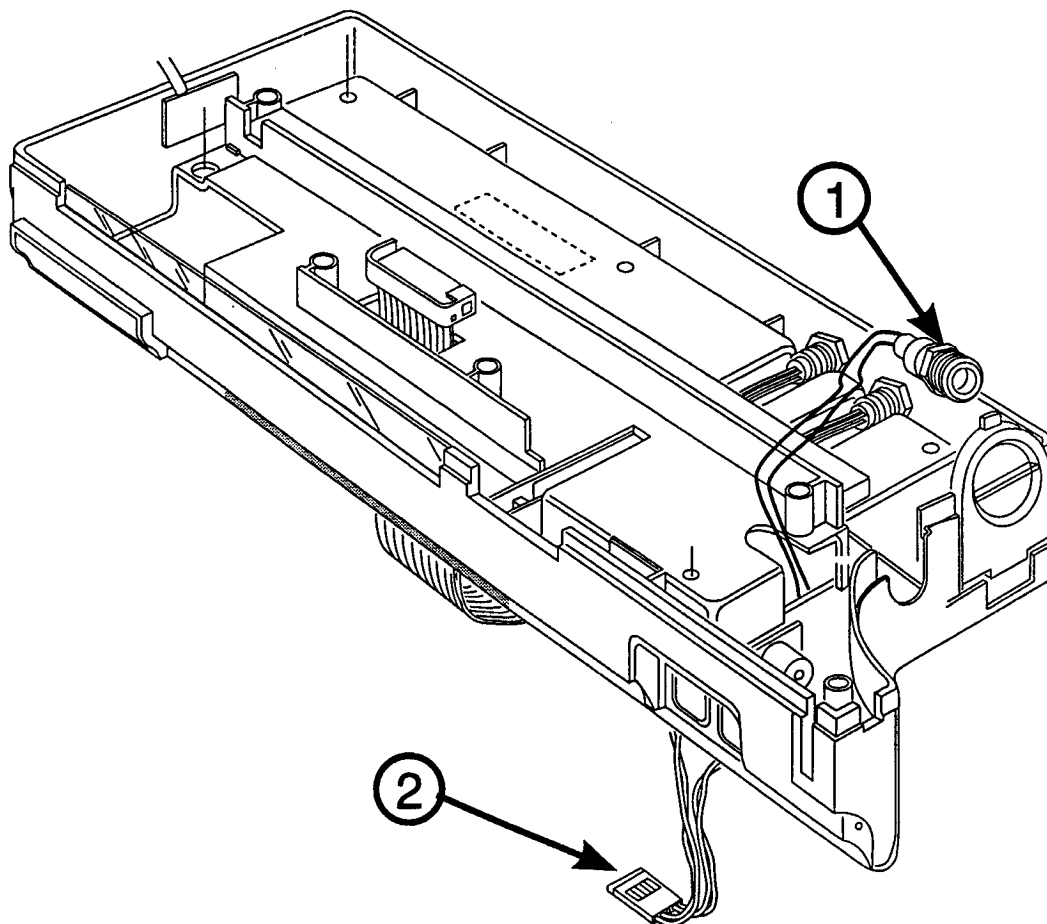


Figure 7-5 Patient Connector Assembly

7.2.7 MPU Circuit Board

1. Perform the following procedure before trying to remove the MPU board:
 - a) Remove the rear case half assembly using the procedure of section 7.2.2.
 - b) Remove the mechanism assembly using the procedures of section 7.2.4.
 - c) Remove the front switch plate assembly using the procedures of section 7.2.5.
2. Remove the five screws (1) that hold the MPU (2) to the front panel assembly.
3. Disconnect the cables J9 (3) and J11 (4) from the MPU.
4. Remove the MPU from the front panel.
5. To remove the display, turn the MPU over and remove the three screws that hold the display to the MPU. Disconnect the cable at J13 and disconnect the ribbon cable from the display.

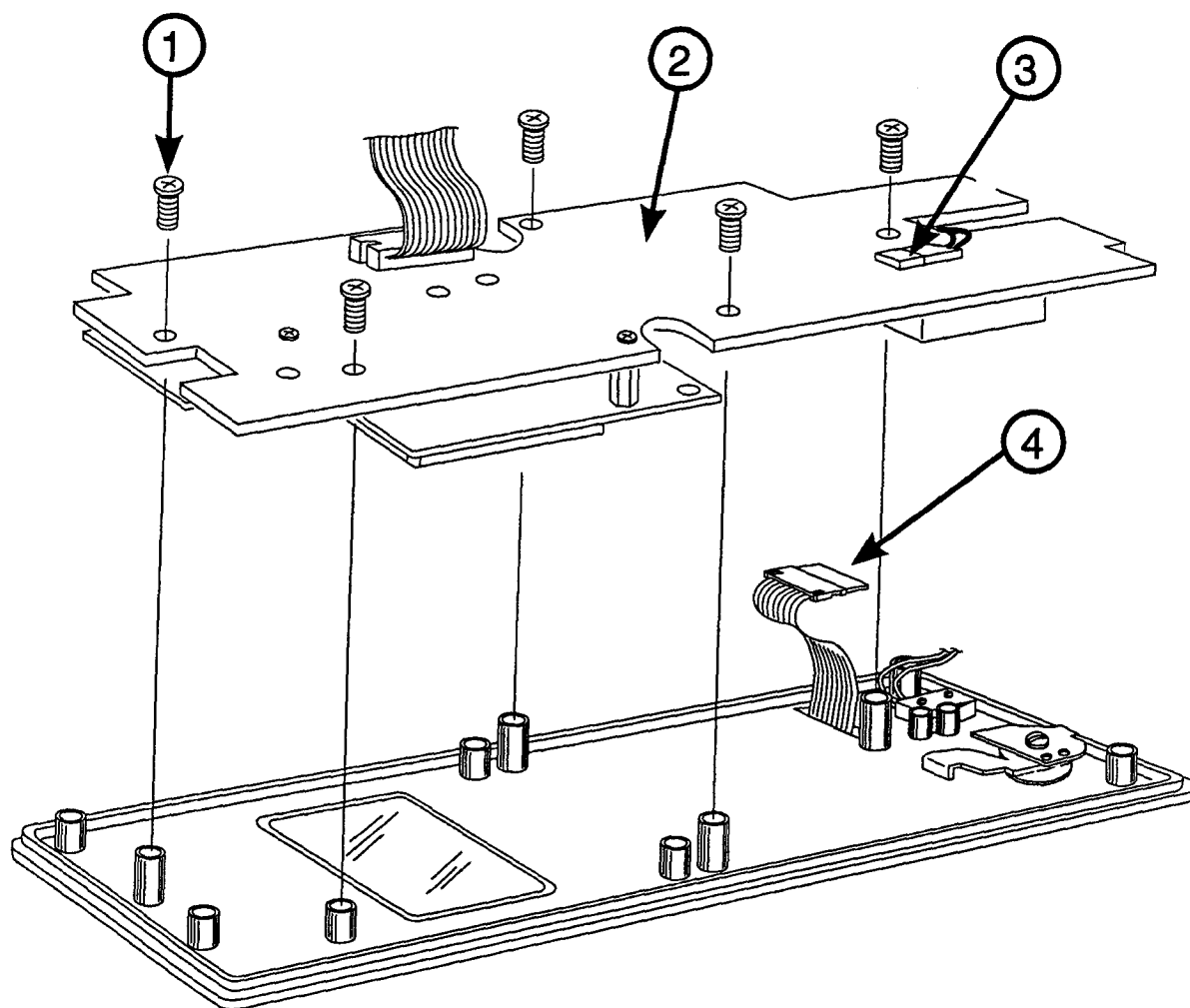


Figure 7- 6 MPU Circuit Board

7.2.8 Case Cover Assembly

1. Perform the following procedure before trying to remove the case cover components:
 - a) Remove the rear case half assembly using the procedure of section 7.2.2.
 - b) Remove the mechanism assembly using the procedures of section 7.2.4.
 - c) Remove the front switch plate assembly using the procedures of section 7.2.5.
 - d) Remove the MPU using the procedures of section 7.2.7.
2. To remove the latch microswitch (1), remove the two screws (2). The switch has a connector that attaches to J9.
3. To remove the latch assembly, remove the screw (3) and washer (4) that holds the latch on the lock assembly.
4. Remove the latch and actuator (5) from the lock assembly.
5. Remove the nut (6) and washer (7) that secure the lock assembly to the front panel.
6. Lift bottom portion of the keypad.
7. Slip the lock assembly out the front of the panel.

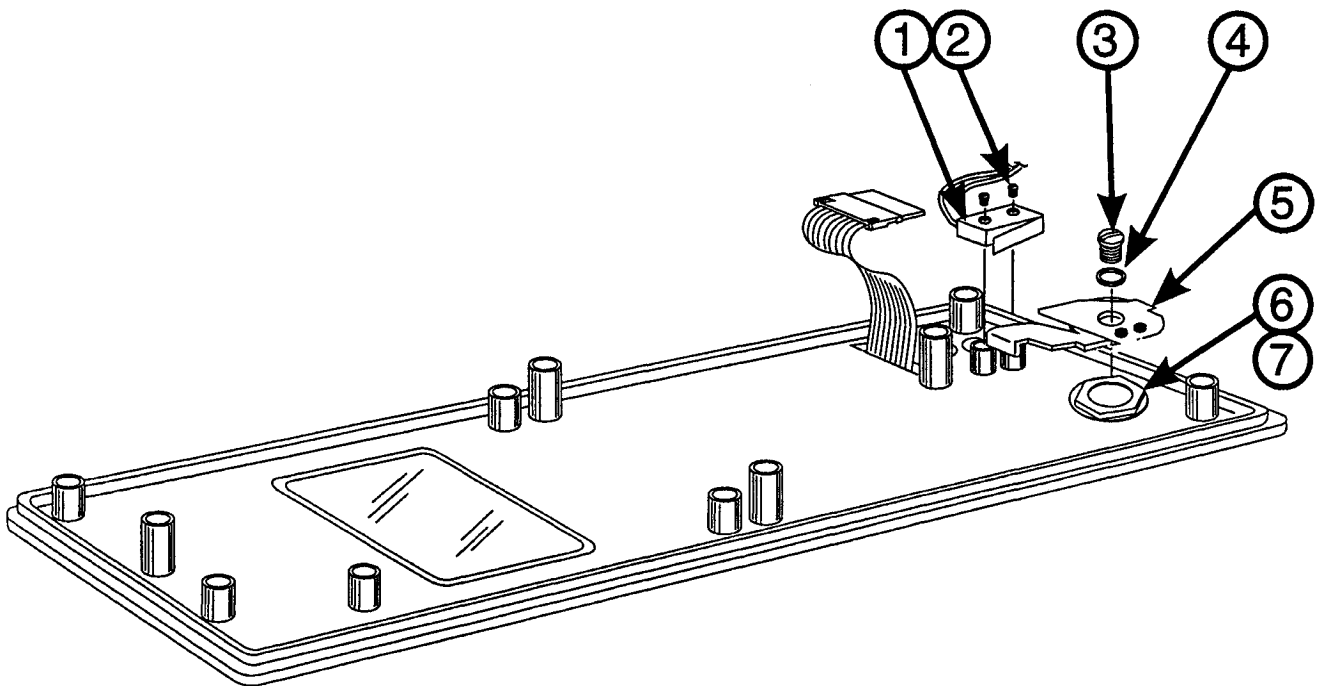


Figure 7-7 Case Cover Assembly

7.2.9 Keypad

1. Perform the following procedure before trying to remove the case cover components:
 - a) Remove the rear case half assembly using the procedure of section 7.2.2.
 - b) Remove the mechanism assembly using the procedures of section 7.2.4.
 - c) Remove the front switch plate assembly using the procedures of section 7.2.5.
 - d) Remove the MPU using the procedures of section 7.2.7.

NOTE

A keypad cannot be reused after it has been removed.

2. Turn the cover over with the keypad facing up. Lift the corner of the keypad and peel off of the front panel.

7.2.10 Syringe Holder

1. Remove the syringe label (1). The label covers the securing screws and cannot be re-used.
2. Remove the two screws (2) from the syringe holder.
3. Lift the syringe holder off of the mechanism assembly.

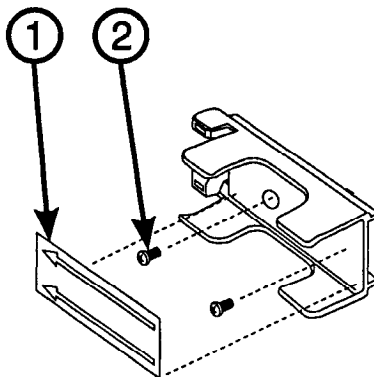


Figure 7-8 Syringe Holder

7.2.11 Mechanism Circuit Board

1. Perform the following procedure before trying to remove the mechanism circuit board:
 - a) Remove the rear case half assembly using the procedure of section 7.2.2
 - b) Remove the mechanism assembly using the procedures in section 7.2.4.
2. Remove the 3 screws (4) that hold the mechanism board (1) to the assembly.
3. Disconnect the 5 mL/EOS microswitch wire connection at J6 (2).
4. Disconnect the pusher block cable at J11 (3).
5. Slide the mechanism board off of the guide pin.

NOTE

When reassembling the mechanism board, ensure that the overpressure microswitch (5) arm is aligned with the syringe block actuator.

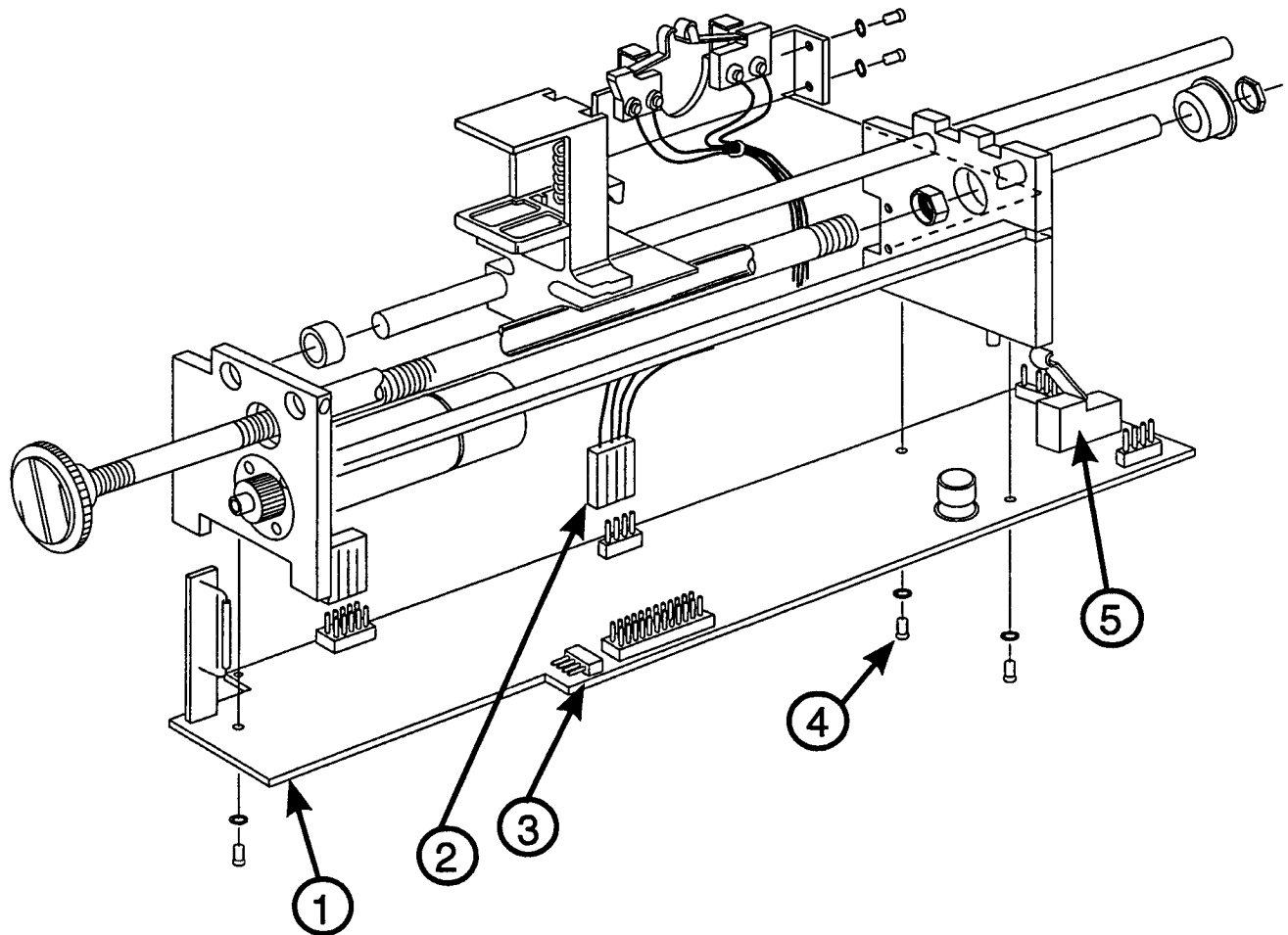


Figure 7-9 Mechanism Circuit Board

7.2.12 5mL/EOS Switch Assembly

1. Perform the following procedure before trying to remove the 5mL/EOS Switch assembly:
 - a) Remove the rear case half assembly using the procedure of section 7.2.2.
 - b) Remove the mechanism circuit board using the procedures of section 7.2.11.
2. Remove the 2 screws (2) that hold the microswitch assembly (1) to the mechanism assembly.

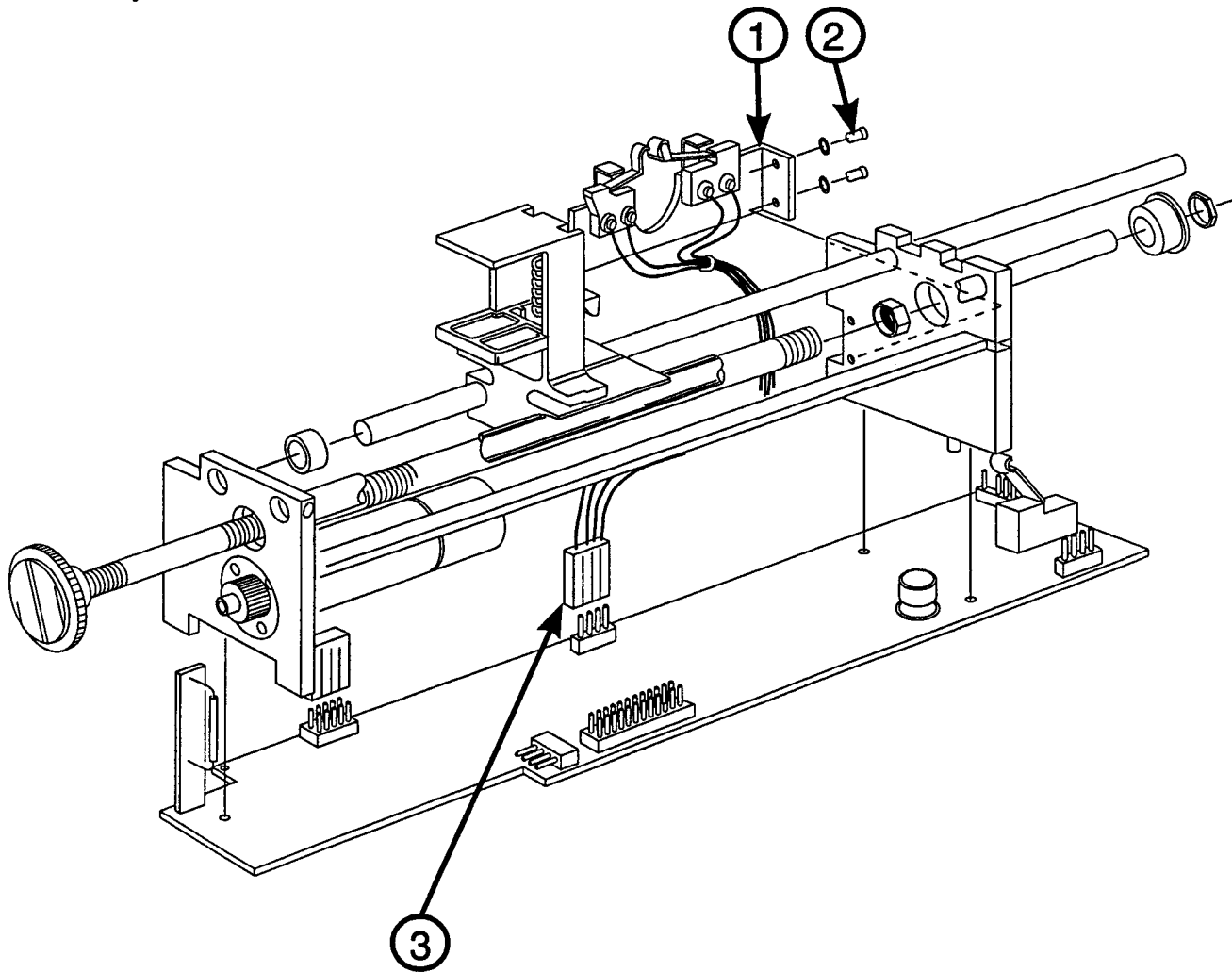


Figure 7-10 5 mL/EOS Microswitch Assembly

3. To replace an individual switch, remove the two screws that hold the switch to the bracket and desolder the wires from the switch.
4. After switch reassembly perform the switch adjustment in Section 7.3.

7.2.13 Motor Assembly

1. Perform the following procedure before trying to remove the motor assembly:
 - a) Remove the rear case half assembly using the procedure of section 7.2.2.
 - b) Remove the mechanism circuit board using the procedures of section 7.2.11.
2. Remove the 3 screws (1) that hold the motor assembly (3) to the motor pillow block.
2. Disconnect the motor cable from the mechanism board at J4 (2).
4. Remove the motor from the mechanism assembly.

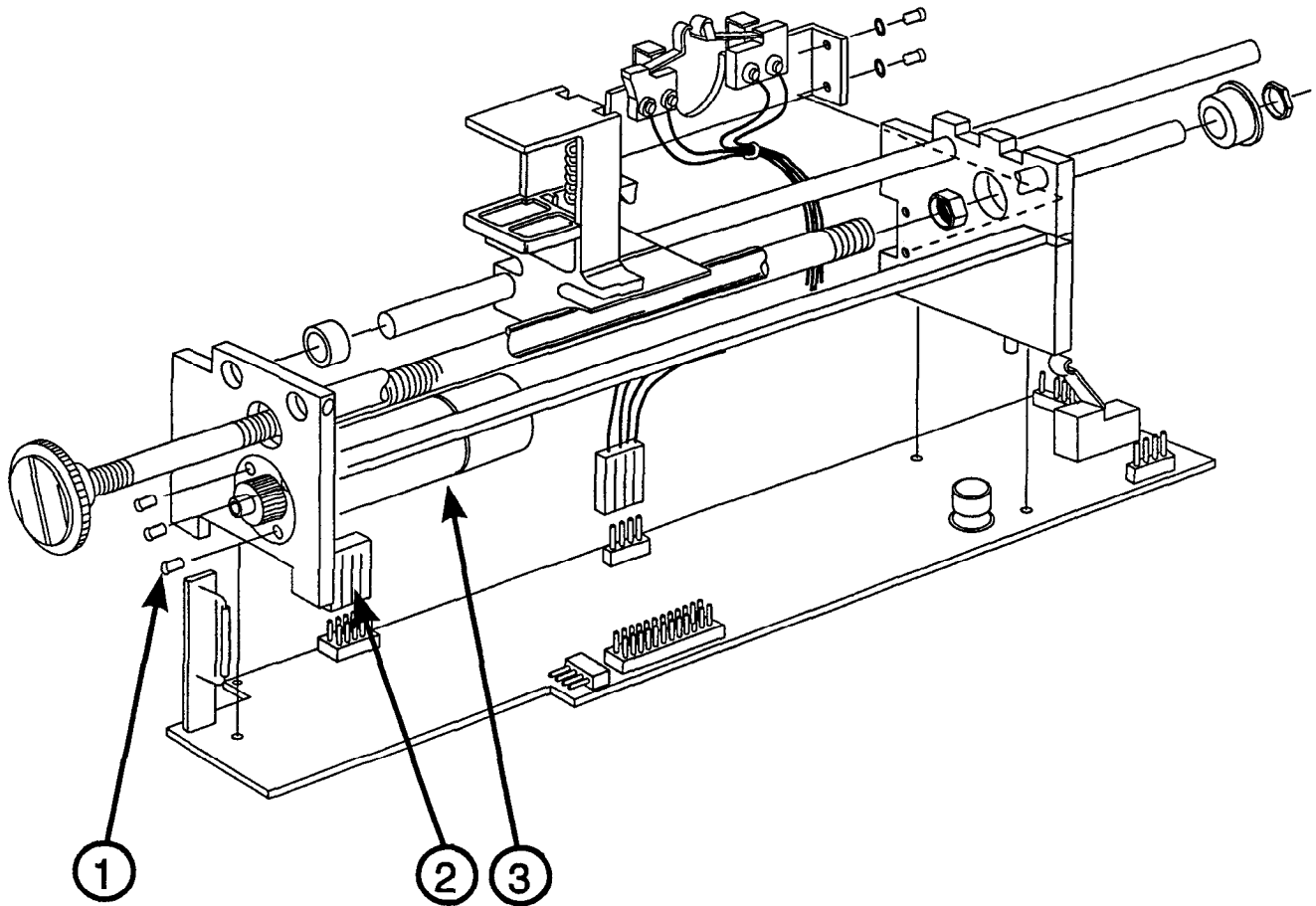


Figure 7-11 Motor Assembly

7.2.14 Syringe Block

1. Perform the following procedure before trying to remove the syringe block assembly:
 - a) Remove the rear case half assembly using the procedure of section 7.2.2.
 - b) Remove the mechanism assembly using the procedures of section 7.2.4.
 - c) Remove the mechanism circuit board using the procedures of section 7.2.11.
2. Loosen the preload collar screw (4) and the Limit collar screw (1).

CAUTION

Use caution when removing the syringe block. The preload spring is under tension and can come loose and become a hazard.

3. Slide the syringe block (3), collars (2)&(5), and preload spring (6), off of the guide rods.

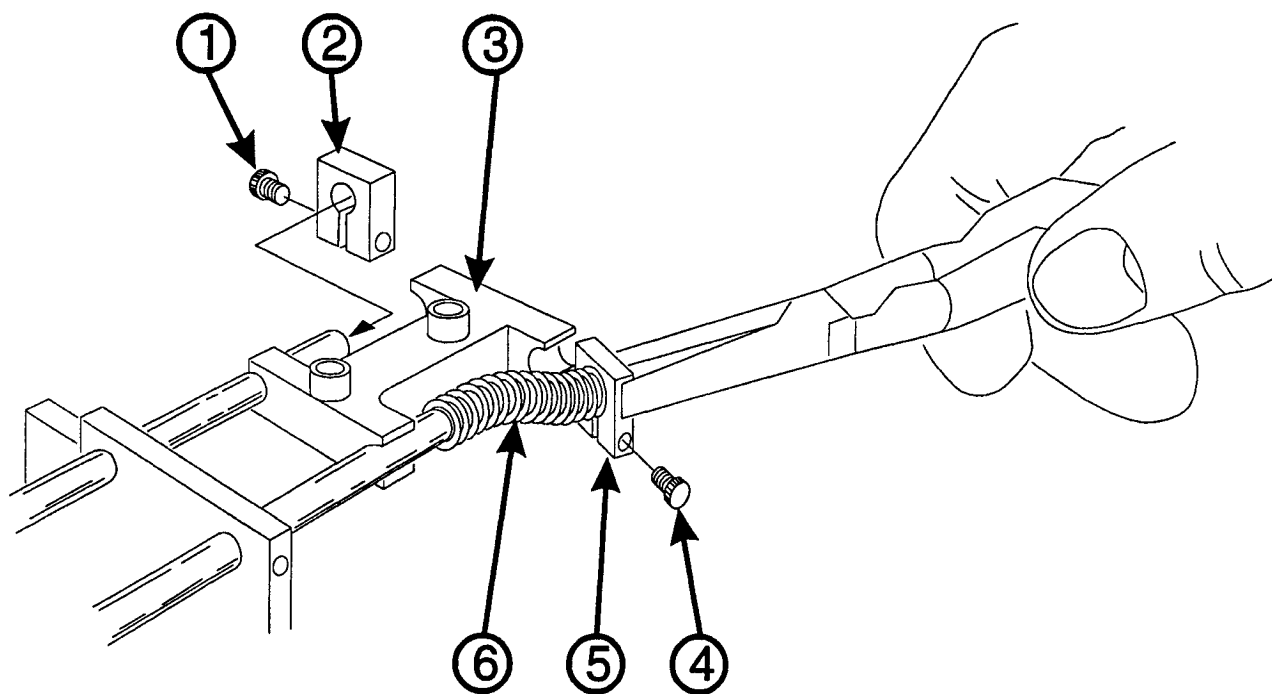


Figure 7-12 Syringe Block Assembly

4. Refer to 7.3 for reassembly and alignment procedures.

7.2.15 Pusher Block Assembly

1. Perform the following procedure before trying to remove the pusher block assembly:
 - a) Remove the rear case half assembly using the procedure of section 7.2.2.
 - b) Remove the mechanism assembly using the procedures of section 7.2.4.
 - c) Remove the mechanism circuit board using the procedures of section 7.2.11.
 - d) Remove the 5 mL/EOS Switch Assembly using the procedures of section 7.2.12.
 - e) Remove the Syringe Block using the procedures of section 7.2.14.
2. Loosen the two screws (2) on the top of the middle pillow block (3).

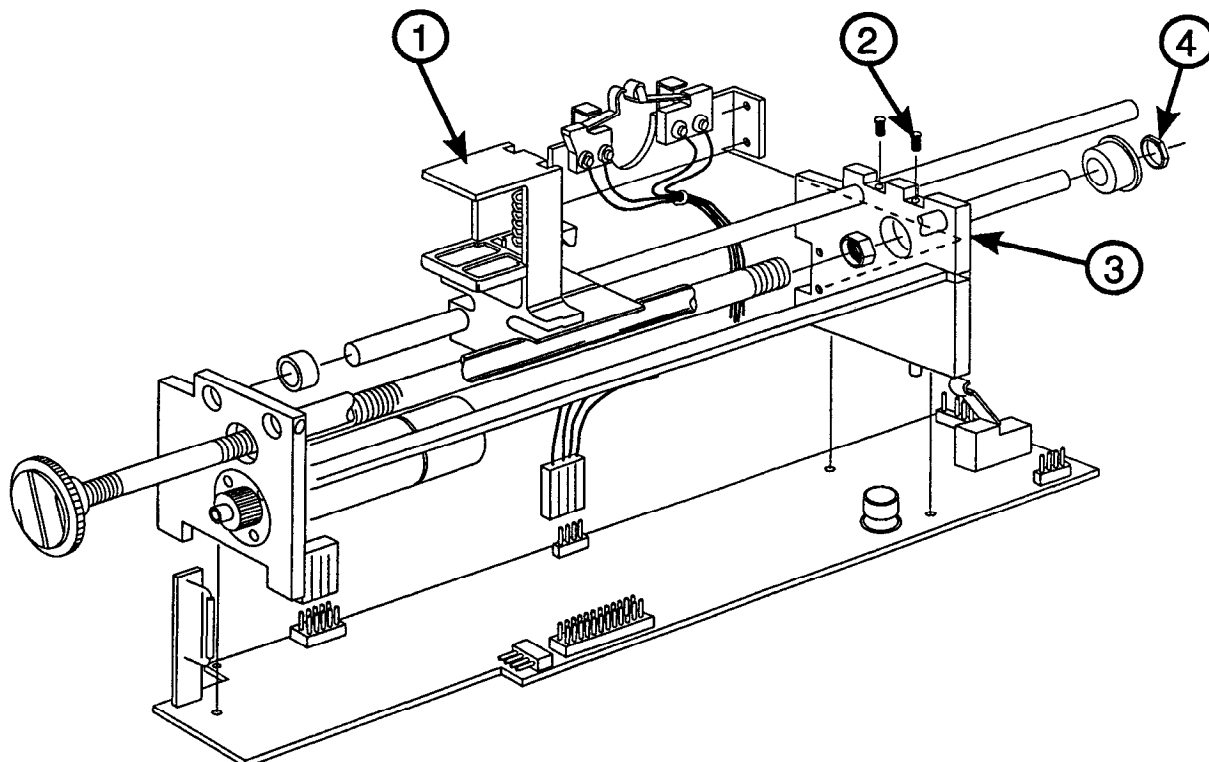
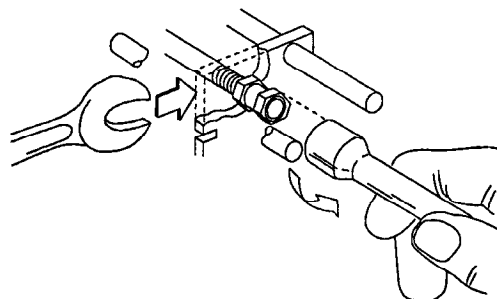


Figure 7-13 Pusher Block Assembly Removal

3. Use a $\frac{7}{16}$ " open end wrench and nut driver to remove the threaded bushing (4) from the lead screw.
4. Carefully slide the middle pillow block off of the guide rods.
5. Remove the pusher block assembly (1) from the guide rods.
6. Refer to 7.3 for reassembly and alignment procedures.



7.2.16 Guide Rods

1. Perform the following procedure before trying to remove the guide rods:
 - a) Remove the rear case half assembly using the procedure of section 7.2.2.
 - b) Remove the mechanism assembly using the procedures of section 7.2.4.
 - c) Remove the mechanism circuit board using the procedures of section 7.2.11.
 - d) Remove the 5 mL/EOS Switch Assembly using the procedures of section 7.2.12.
 - e) Remove the syringe block assembly using the procedures of section 7.2.14.
 - f) Remove the pusher block using the procedures of section 7.2.15.
2. Loosen the set screws (1) on the motor pillow block.
3. Gently tap the motor pillow block off of the guide rod.

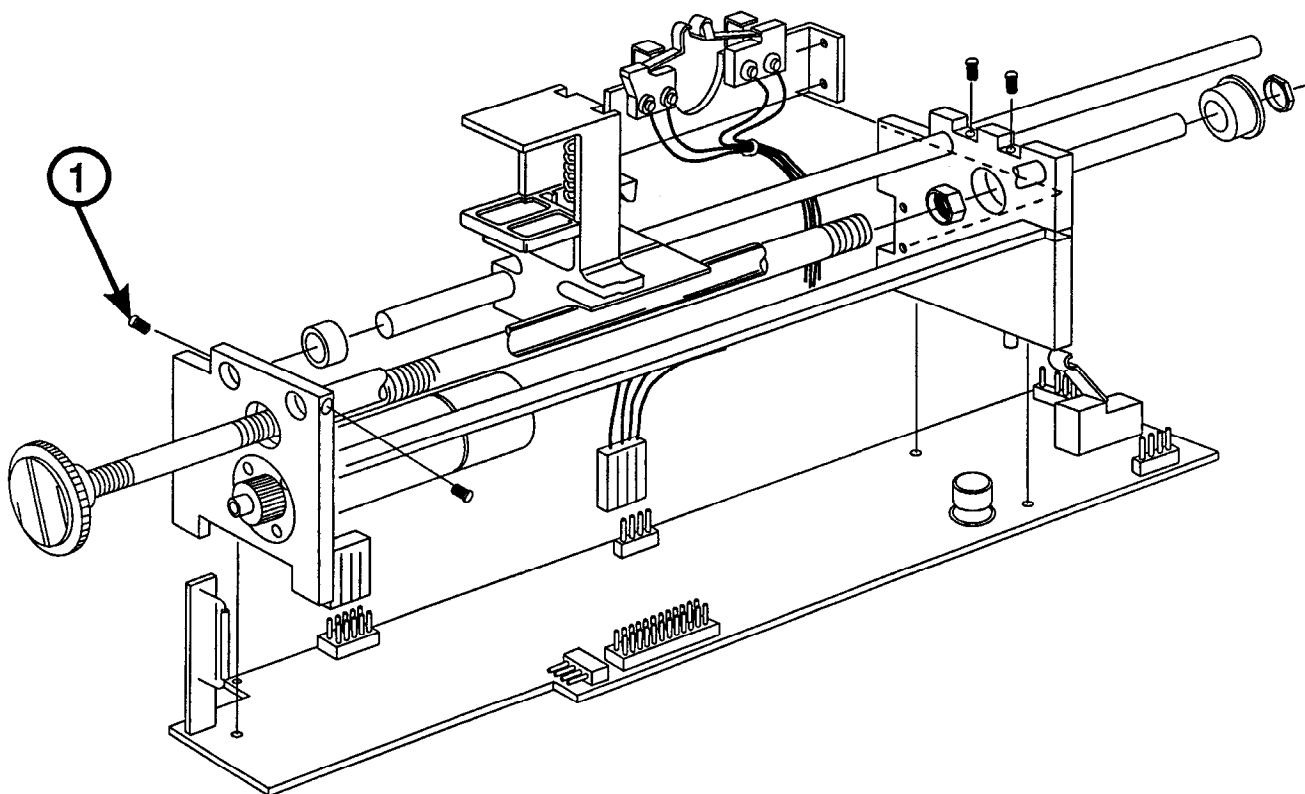


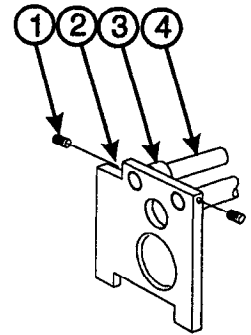
Figure 7-14 Guide Rod Removal

3. Refer to 7.3 for reassembly and alignment procedures.

7.3 MECHANISM REASSEMBLY PROCEDURE

Use this procedure to reassemble the mechanism from all of its base components.

1. Insert the guide rods (4) into the motor pillow block (2) so that the ends of the guide rods are flush with the outside face of the motor pillow block.
2. Tighten the set screws (1) in the motor pillow block that hold the guide rods in place.
3. Slip the nylon washer (3) over the guide rod and put one drop of Loctite 414 adhesive on the washer to hold it in place.



4. Install lead screw assembly (5) through the motor pillow block assembly.
5. Slide the pusher block assembly (6) onto the guide rods and slip it up against the motor pillow block.

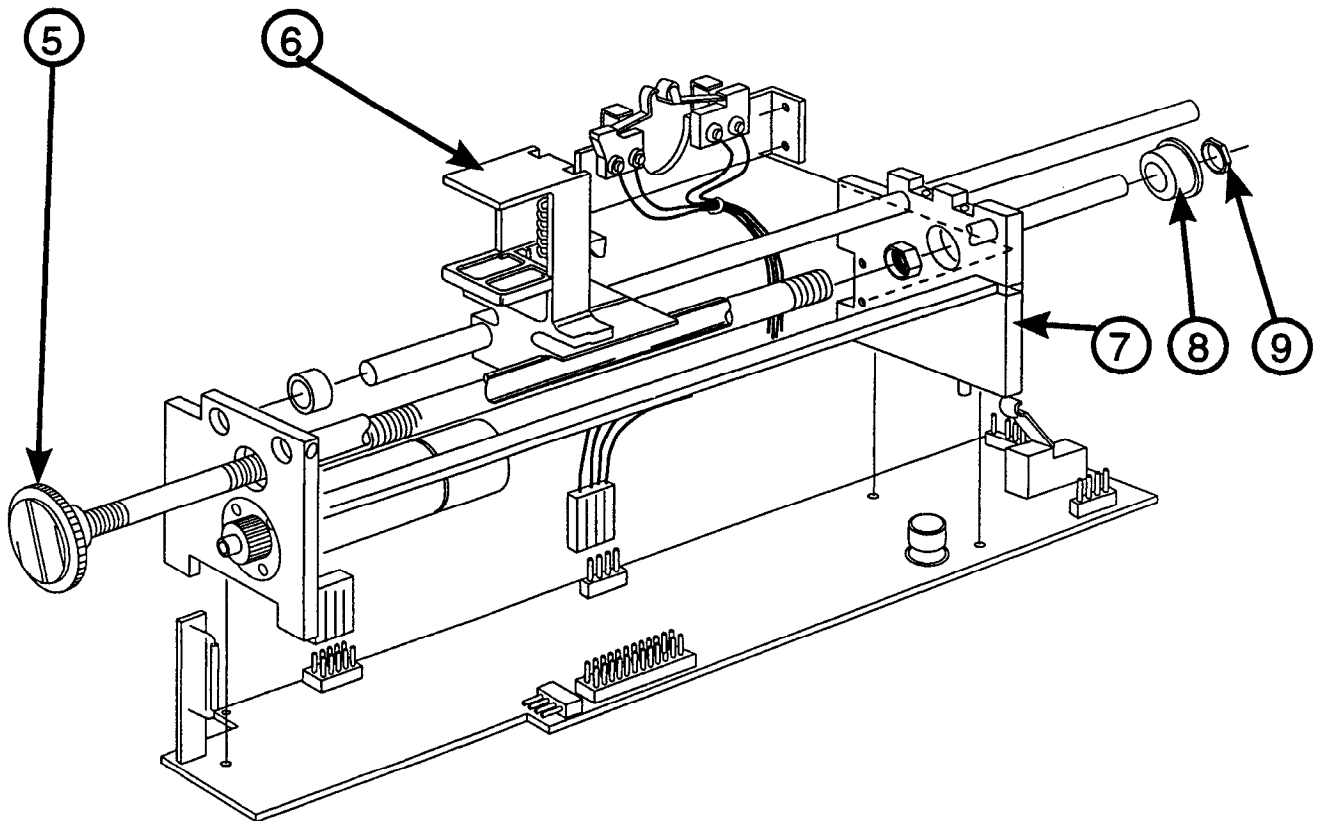
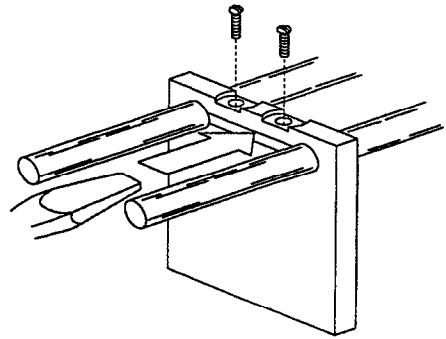


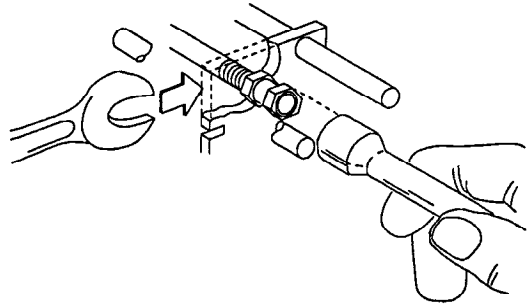
Figure 7-15 Mechanism Reassembly

6. Install the middle pillow block (7) onto the guide rods. Slide it along the guide rods until it is flush with the end of the lead screw. Insert a screwdriver into the middle pillow block slot if it is difficult to slide along the guide rods.



7. Install the threaded bushing (8) & (9) loosely onto the lead screw.

8. Use a nut driver to adjust the position of the middle pillow block so that the distance from the inside edge of the middle pillow block to the outside edge of the motor pillow block is 6.75".



9. While holding the threaded bushing stationary with the nut driver, use the open end wrench to tighten the jam nut.

10. Place the mechanism assembly into the rear case and ensure that the two pillow blocks fit within the locators molded into the case.

11. Remove the assembly from the rear case.

12. Tighten the screws that secure the middle pillow block to the guide rods.

13. If not already attached, install the motor to the motor pillow block. Ensure that there is no binding between the motor and lead screw gears. If necessary loosen and retighten the motor screws to free up any binding.

14. Place the syringe block and limit collar onto the guide rods. Slide the preload spring $\frac{1}{4}$ of the way onto the guide rod.

15. Using needle nose pliers, grasp the preload collar (leave space at the tip of the pliers for the end of the spring).

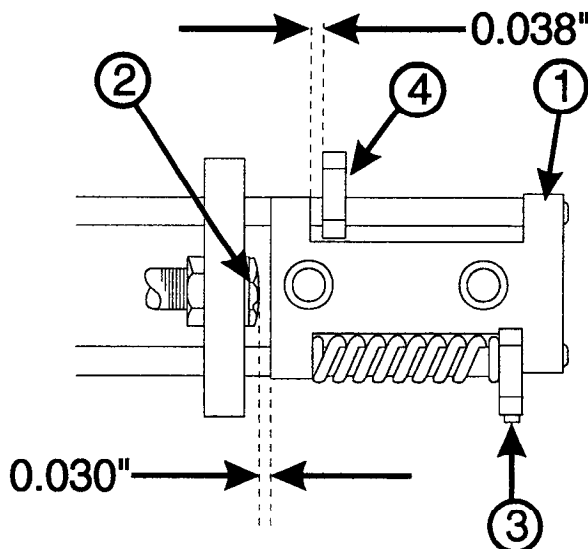
16. Push the preload spring and preload collar completely onto the guide rod.

17. Adjust the syringe block as outlined in section 4.4.

7.4 SYRINGE BLOCK ALIGNMENT

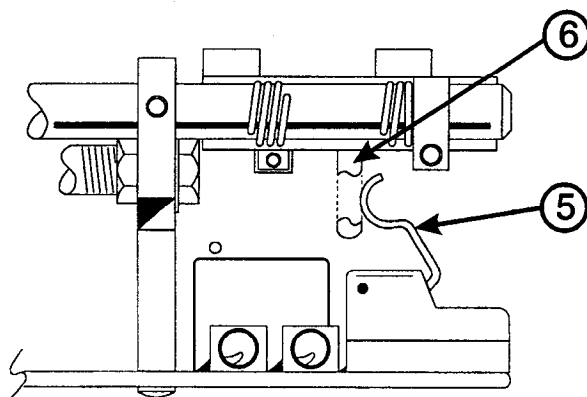
7.4.1 Syringe Block Alignment

1. Insert a 0.030" gauge between the syringe block (1) and the outside surface of the threaded bushing (2).
2. Tighten the preload collar cap screw (3).
3. Verify that there is still 0.030" between the syringe block and the threaded bushing.
4. Bend the switch arm (5) until it just touches the syringe block actuator (6).



7.4.2 Limit Distance Calibration

1. Insert a 0.038" gauge between the limit collar (4) and the syringe block (1).
2. Slide the limit collar against the gauge and tighten the limit collar cap screw.
3. Verify the 0.038" distance between the limit collar and the syringe block.



7.4.3 Syringe Block Adjustment

1. Holding the mechanism assembly firmly, pull back the syringe block toward the occlusion microswitch.
2. Install a 0.014" gauge between the preload collar and the syringe block, then release the syringe block.
3. Use an ohmmeter to measure the resistance between the two outside terminals of the occlusion microswitch.
4. Check the resistance for a "closed" condition. This is the normal operating position.
5. If the circuit reads "open", bend the switch arm (5) (using needle nose pliers) slightly away from the syringe block until a "closed" circuit is obtained.
6. Remove the 0.014" gauge and install a 0.023" gauge in its place.

7. Use an ohmmeter to measure the resistance between the two outside terminals of the occlusion microswitch.
8. Check the resistance reading for an "open" condition. This is the occlusion activation position.
9. If the circuit reads "closed", bend the switch arm (using needle nose pliers) slightly tighter to the syringe block actuator until an "open" reading is obtained.
10. Repeat this procedure from step one until no further adjustments are required.

7.5 5 mL/EOS ADJUSTMENTS

This procedure outlines the steps necessary to check and adjust the 5mL and EOS alarms. For assembled Pumps, the unit may be set up to run in the basal mode and this test performed using the 5 mL and EOS alarm signals as an indication of switch activation.

1. Adjust the plunger of a 60 cc syringe so that it lines up with the 8 mL division and install it in the Pump. Ensure that the syringe flange is against the syringe holder.
2. Pull up on the pusher block release lever and SLOWLY move the pusher block toward the 5 mL switch.
3. Stop as soon as the 5 mL switch is activated. This can be detected through the audible click of the switch or by monitoring the switch with an ohmmeter.
4. Verify the syringe reads 4 to 6 mL remaining. If it does not, complete EOS testing and make adjustments as outlined in steps 8 or 9 below.
5. Pull up on the pusher block release lever and SLOWLY move the pusher block toward the EOS switch.
6. Stop as soon as the EOS switch is activated. This can be detected through the audible click of the switch or by monitoring the switch with an ohmmeter.
7. Verify that the syringe reads 2 mL or less. If it does not, make adjustments as outlined in step 8 or 9 below.
8. If the switch activated too soon, loosen the two mounting screws that hold the assembly to the mechanism assembly and slide the switch assembly toward the middle pillow block.
9. If the switch activated too late, loosen the two mounting screws that hold the assembly to the mechanism assembly and slide the switch assembly away from the middle pillow block.
10. Repeat this procedure until no further adjustments are needed.

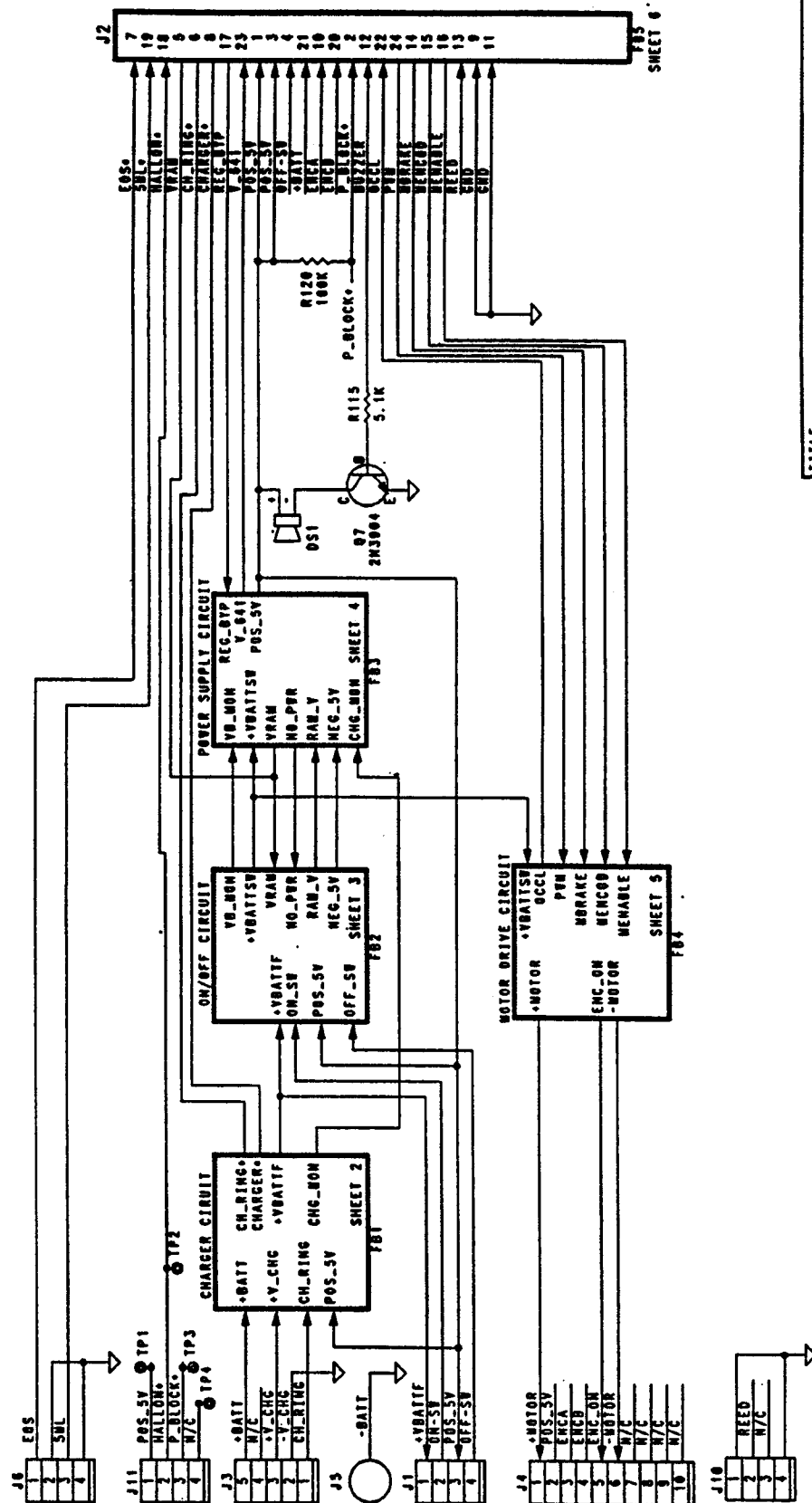
A.1 GENERAL

This appendix contains all of the schematic and wiring diagrams for the PCA II Pump. A table of contents for this section is shown below:

Drawing Number	Description
6464893	SCHEMATIC, PCA II PUMP, MECHANISM BOARD
6464978	SCHEMATIC, PCA II PUMP, MPU BOARD

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TITLE

SCHEMATIC, PCA II PUMP, MECHANISM BOARD

SIZE

A

DRAWING NUMBER

6464893

REVISION

1

SCALE

NONE

LOC

SHEET

FIRST USED ON

6464895

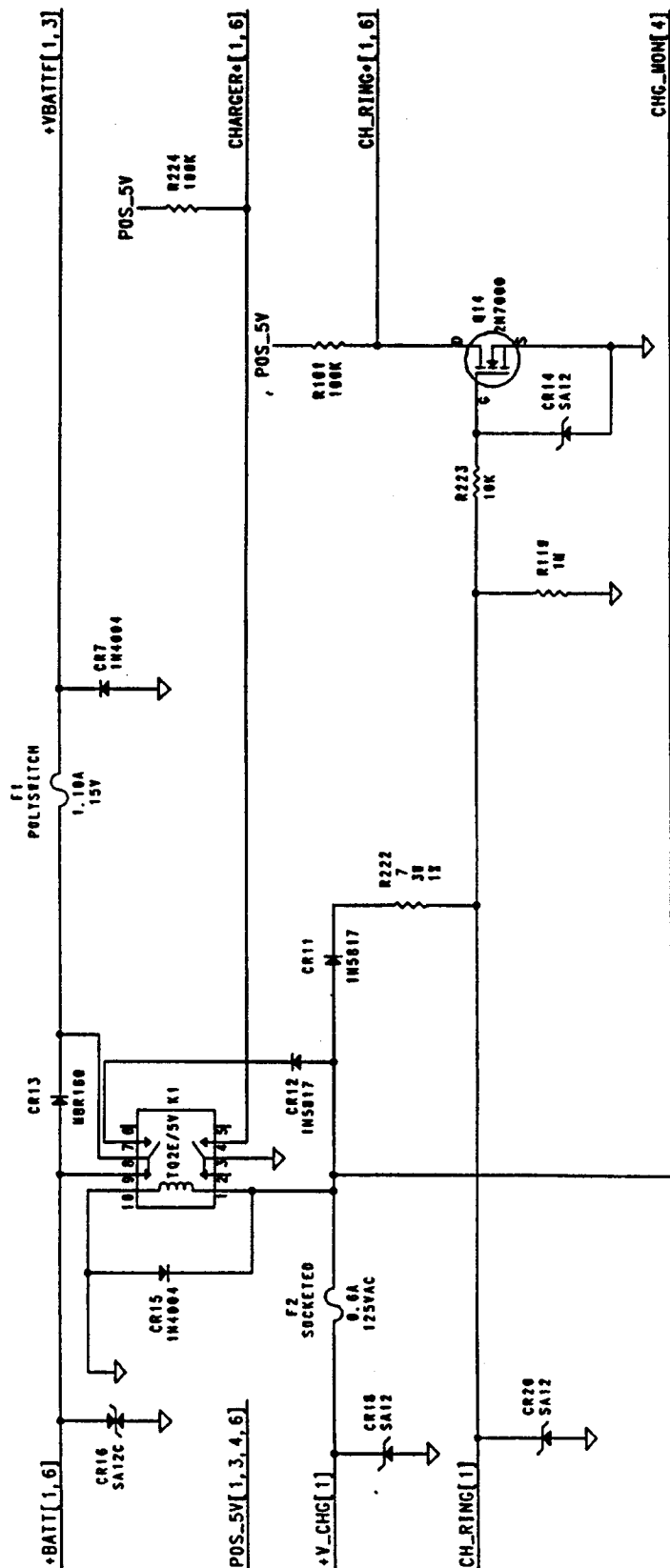
1 OF 6

NOTES:

1. UNLESS OTHERWISE SPECIFIED, ALL RESISTORS ARE 1/4W, 5% AND RESISTANCE VALUES ARE IN OHMS.
2. TERMINAL NUMBERING FOR J2 AND J4 ARE FOR REFERENCE ONLY. SEE FIGURE A(J2) OR B(J4) FOR TERMINAL LOCATION.
3. [N] - A NUMBER IN BRACKETS INDICATES THE PAGE(S) TO WHICH THE SIGNAL CONNECTS.

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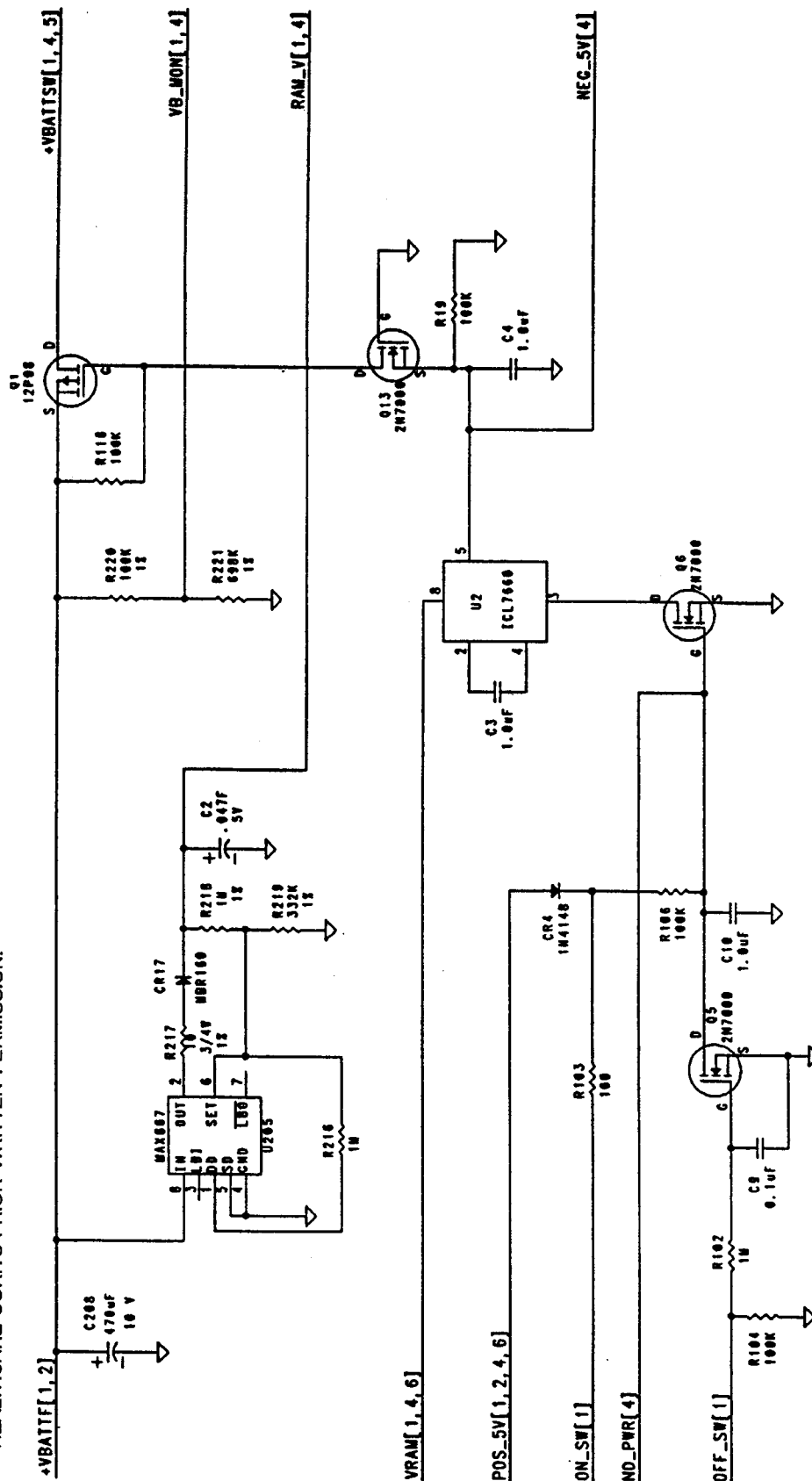
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TITLE SCHEMATIC, PCA II PUMP
MECHANISM BOARD, CHARGER CIRCUIT

SIZE	DRAWING NUMBER	REVISION	
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SCALE	FIRST USED ON	LOC	SHEET
NONE			2 OF 6

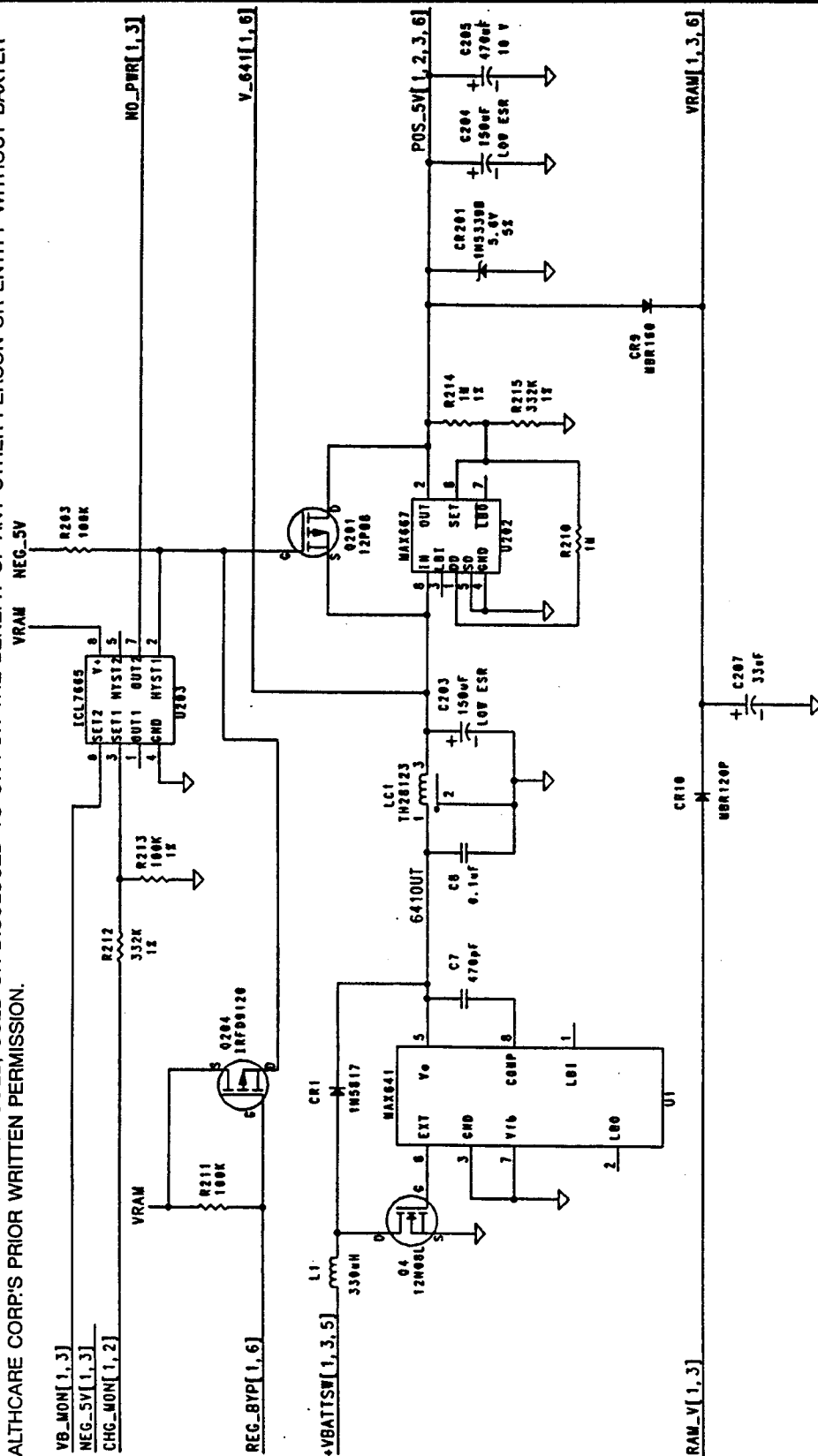
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TITLE		SCHEMATIC, PCA II PUMP MECHANISM BOARD, ON-OFF CIRCUIT	
SIZE	DRAWING NUMBER	REVISION	
A	6464893	1	
SCALE	FIRST USED ON	LOC	SHEET
NONE			3 OF 6

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VRAM NEG.5V

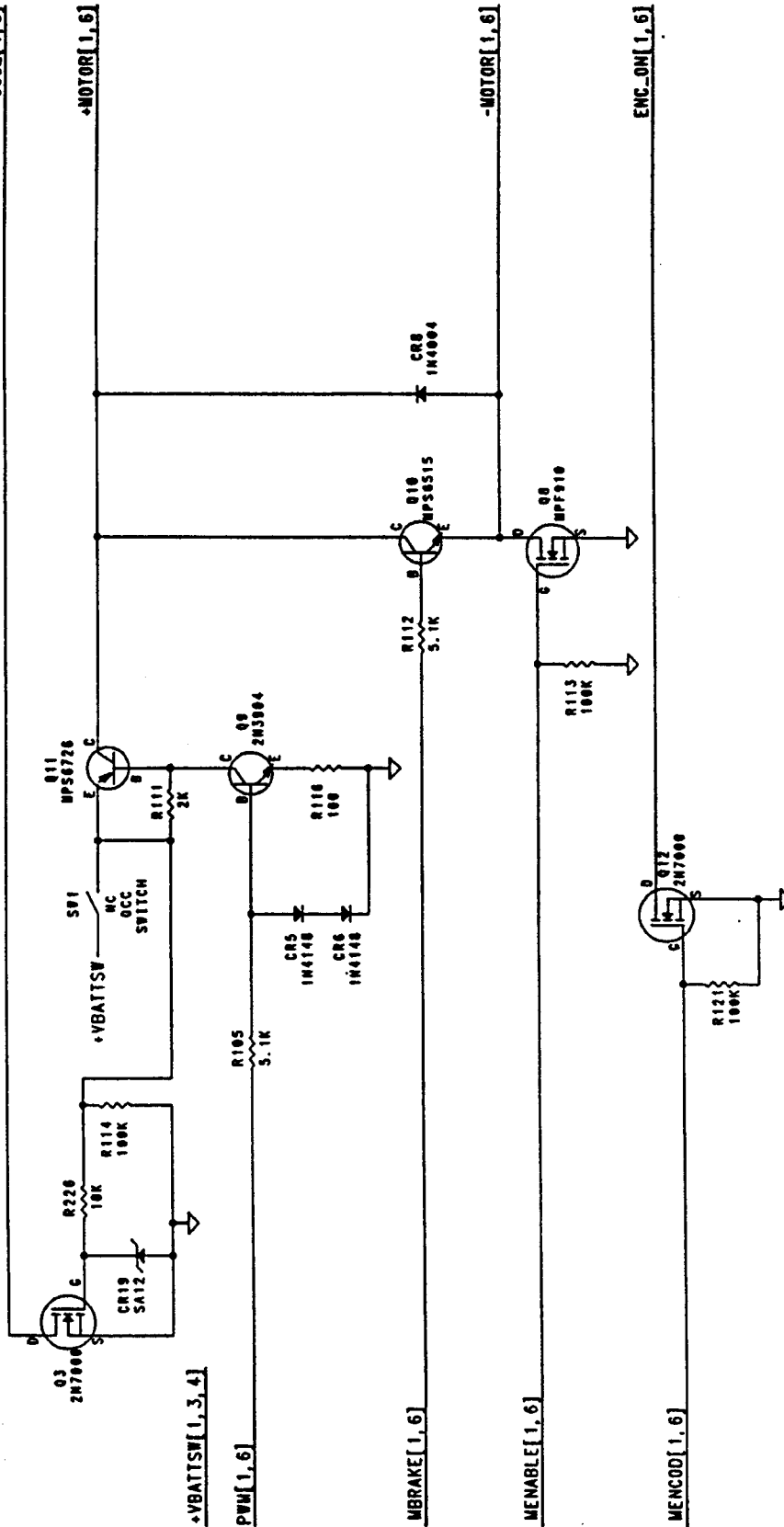


TITLE		SCHEMATIC, PCA II PUMP MECHANISM BOARD, POWER SUPPLY CIRCUIT		
SIZE	GRATING NUMBER	REVISIOS		
A	6464893	1		
SCALE	FIRST USED ON	LOC	SHEET	
NONE			4 OF 6	

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0CCL[1,6]



TITLE			
SCHEMATIC, PCA 11 PUMP			
MECHANISM BOARD, MOTOR DRIVE CIRCUIT			
SIZE	DRAWING NUMBER	REVISION	
A	6464893	1	
SCALE	FIRST USED ON	LOC	SHEET
NONE			5 OF 6

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FIGURE A
TOP VIEW

HIGHEST REF DESIGNATION	DATE	BY	REMARKS
100	10/1/78	100	100

REF	DESIGNATION	NOT USED

[illegible]

CDW10-0

FIGURE B
TOP VIEW

TITLE			
SCHEMATIC, PCA 11 PUMP, MECHANISM BOARD, (FBS)			
SIZE	DRAWING NUMBER	REVISION	
A	6464893	1	
SCALE	FIRST USED ON	LOC	SHEET
NONE			6 OF 6

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HIGHEST REF DESIGNATION										
C52	CR17	DS2	J17	L1	PD10	Q5	R37	RA15	T1	TP106
REF DESIGNATION NOT USED										
C16			J1-8		PD3-4		R21	RA4		U10
C18					PD7-8		R33			U21-23
C37							R35			U25-26
C41										
C47										

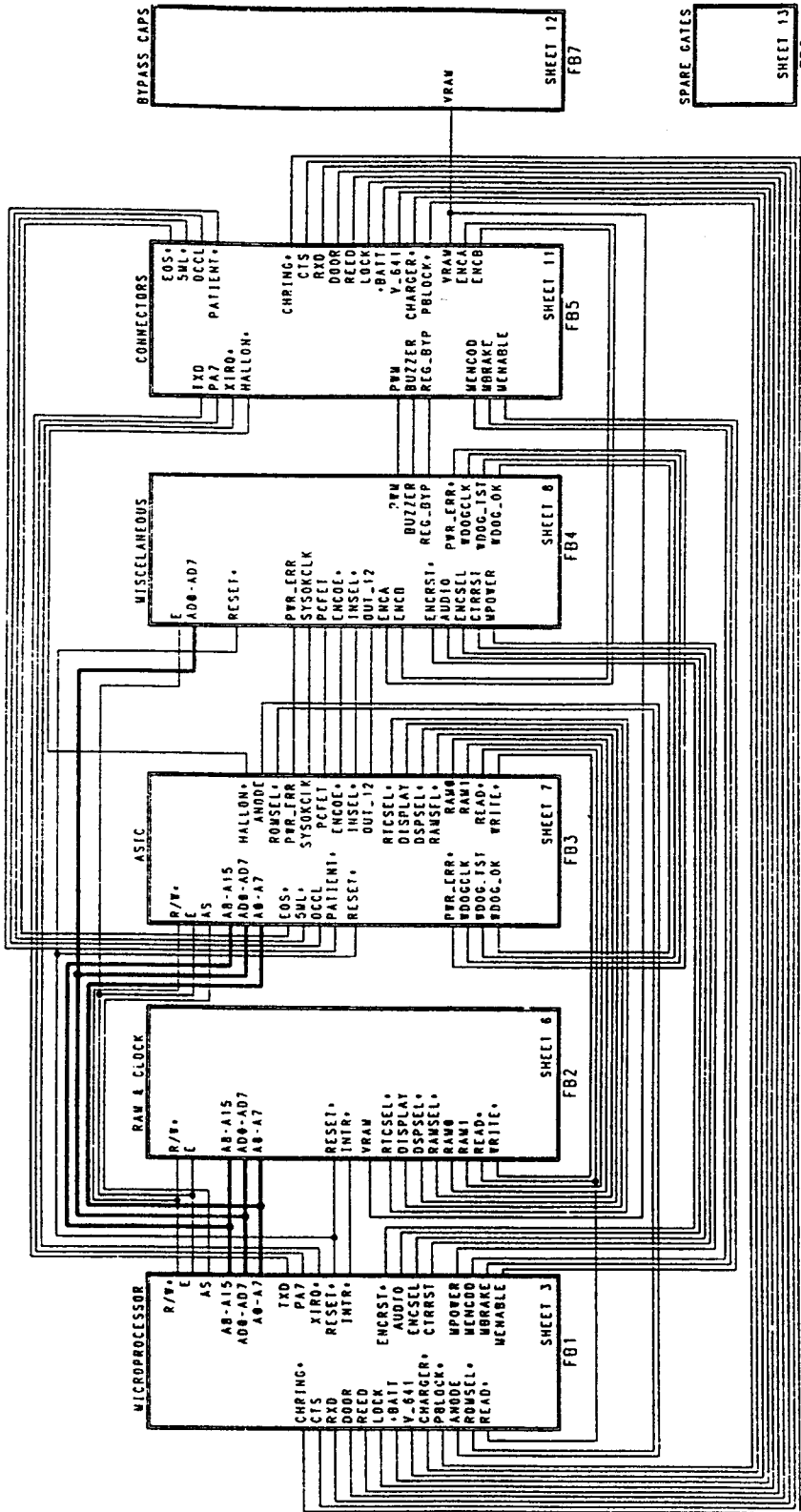
NOTES:

- 1. UNLESS OTHERWISE SPECIFIED, ALL RESISTORS ARE MAXIMUM 1/4 W, MAXIMUM 5%. ALL RESISTANCE VALUES ARE IN OHMS.
- 2. <N> - A NUMBER ENCLOSED IN ANGLE BRACKETS INDICATES THE NUMBER OF WIRES IN A BUS.
- 3. [H] - A NUMBER ENCLOSED IN SQUARE BRACKETS INDICATES THE PAGE TO WHICH A SIGNAL CONNECTS.
- 4. DECOUPLING CAPACITORS SHOWN CONNECTED BETWEEN POWER AND GROUND ON SPECIFIED DEVICES AND CONNECTORS SHOULD BE PLACED AS CLOSE AS POSSIBLE TO EITHER THE POWER OR GROUND PIN.

TITLE			
SCHEMATIC, PCA11 PUMP, MPU BOARD			
SIZE	DRAWING NUMBER	REVISION	
A	6464978	1	
SCALE	FIRST USED ON	LOC	SHEET
NONE			1 OF 13

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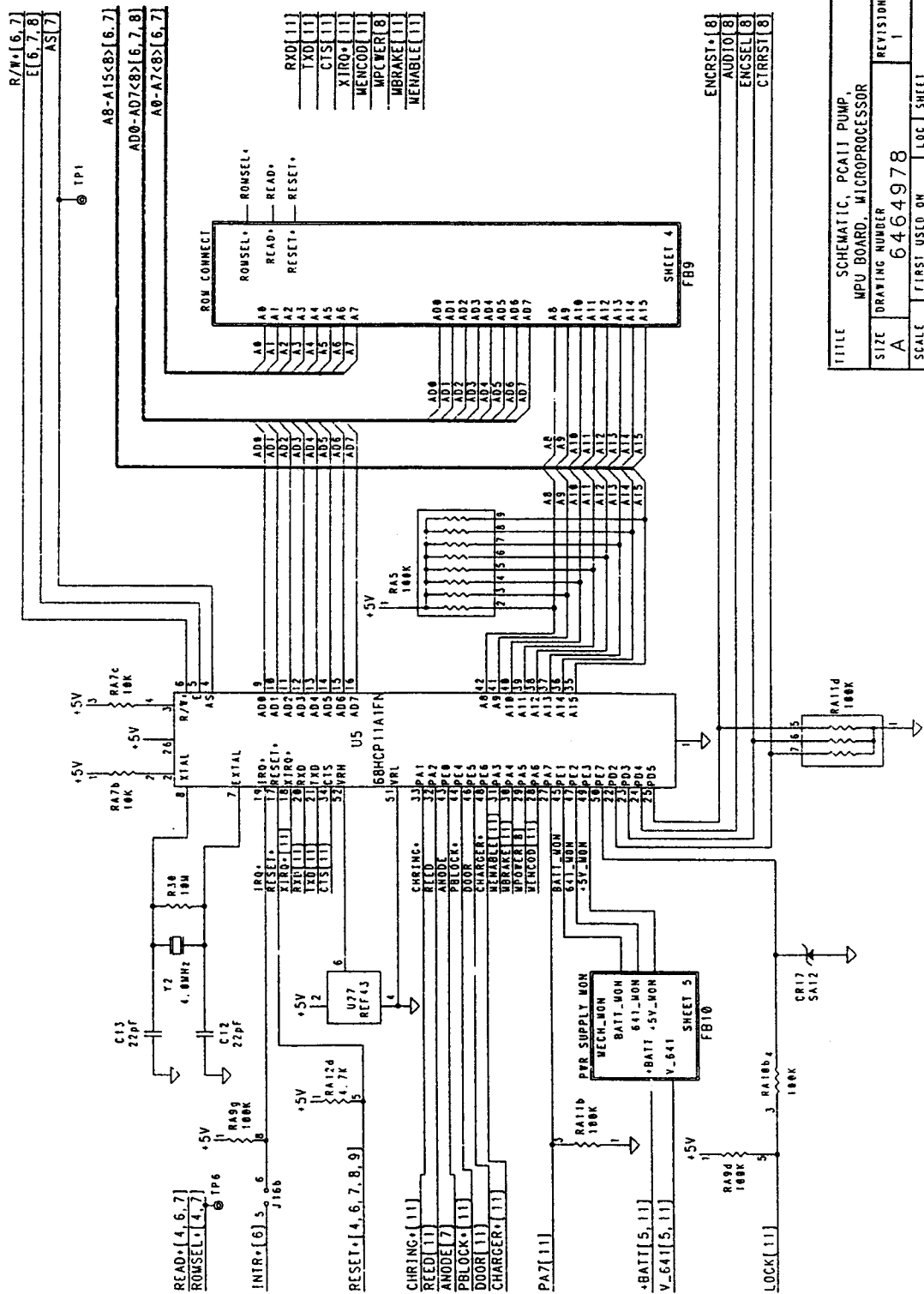
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TITLE			
SCHEMATIC, PCA11 PUMP, MPU BOARD			
SIZE		REVISION	
A		1	
DRAWING NUMBER		6464978	
SCALE		FIRST USED ON	
NONE		LOC	
		SHEET	
		2 OF 13	

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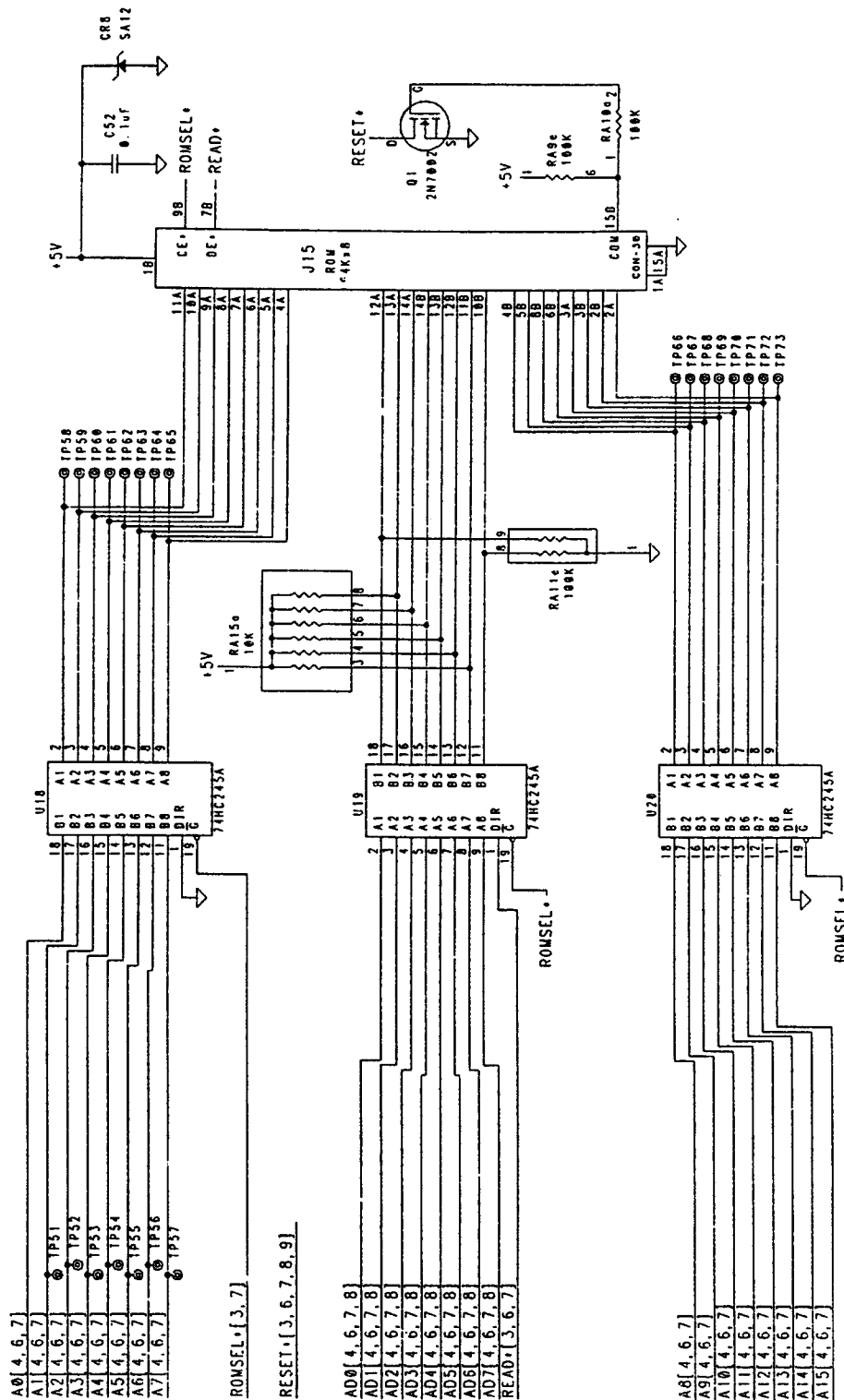
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TITLE			
SCHEMATIC, PCAT1 PUMP,			
NPUI BOARD, MICROPROCESSOR			
SIZE	DRAWING NUMBER	REVISION	
A	6464978	1	
SCALE	FIRST USED ON	LOC	SHEET
NONE			3 OF 13

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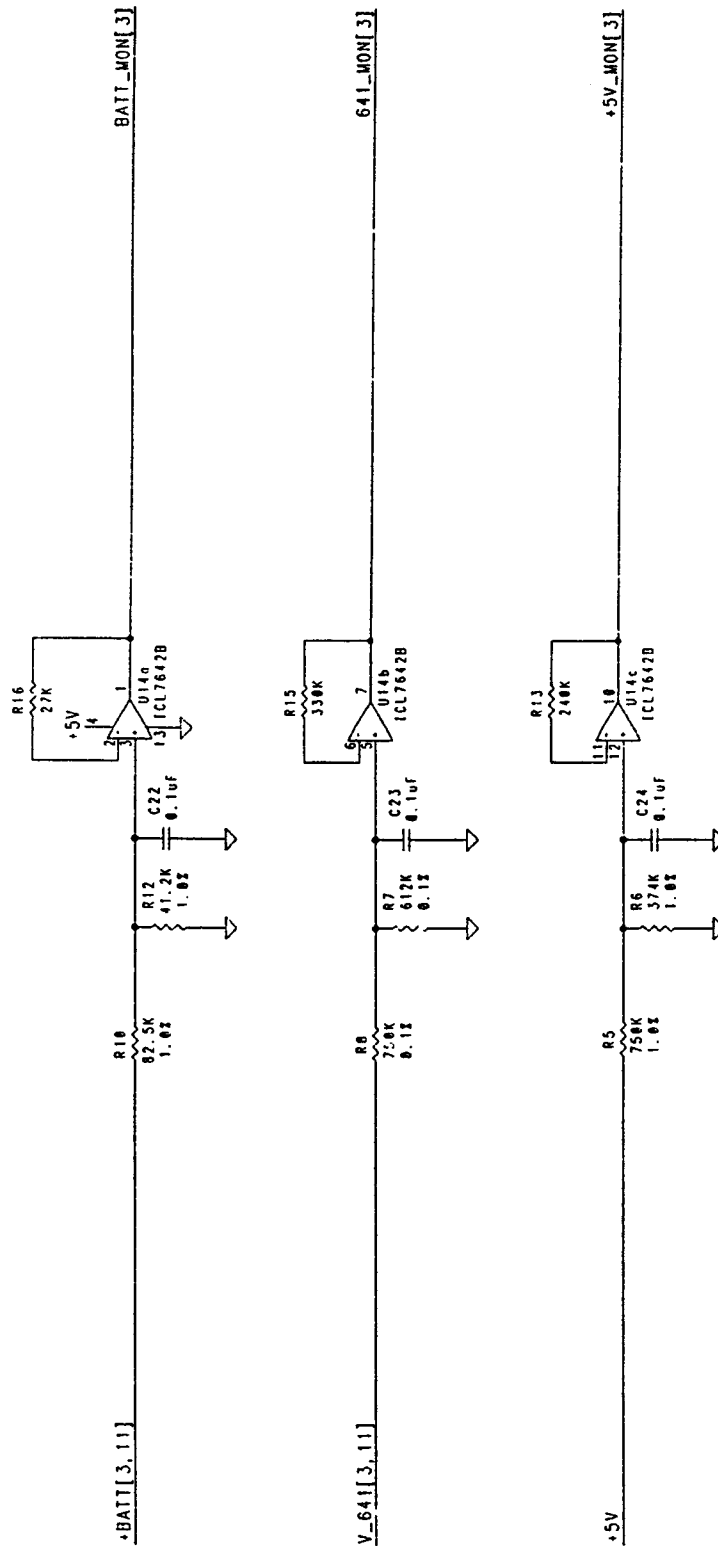
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TITLE SCHEMATIC, PCA11 PUMP,			
MPU BOARD, ROM CONNECTOR			
SIZE	DRAWING NUMBER	REVISION	
A	6464978	1	
SCALE	FIRST USED ON	LOC	SHEET
NONE			4 OF 13

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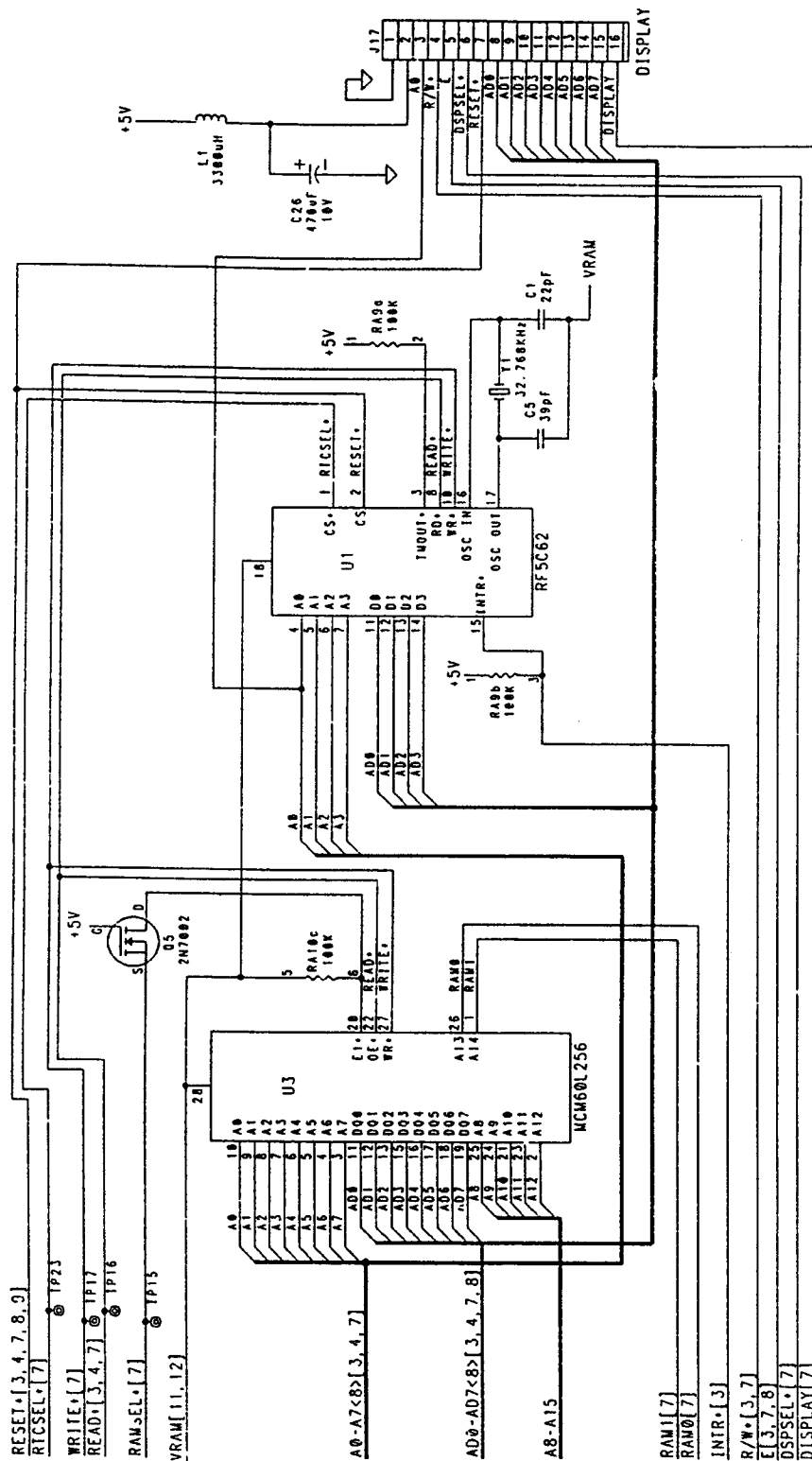
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TITLE SCHEMATIC, PCA11 PUMP, MPU BOARD, POWER SUPPLY MONITOR			
SIZE A	DRAWING NUMBER 6464978	REVISION 1	
SCALE NONE	FIRST USED ON	LOC SHEET	5 of 13

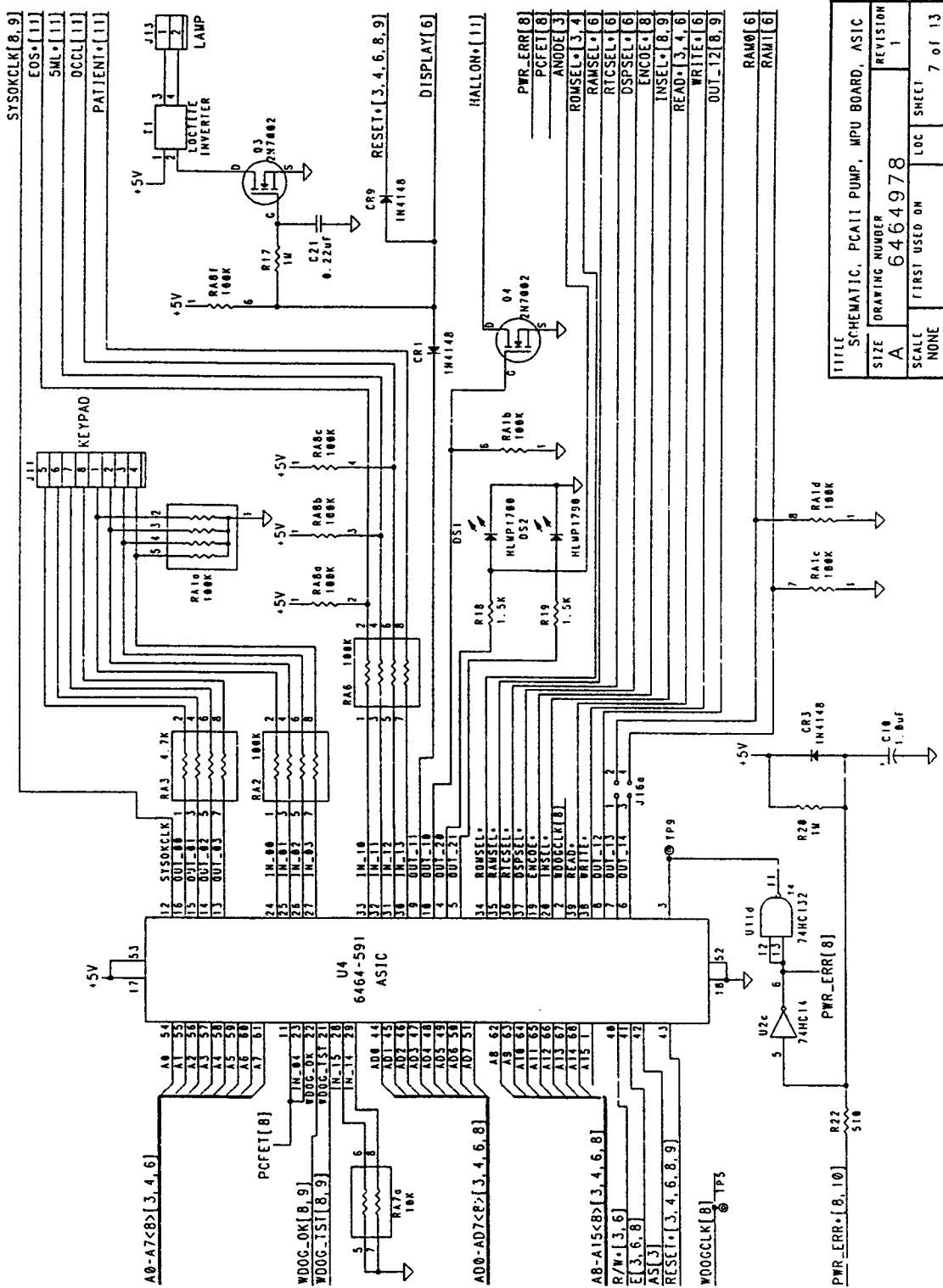
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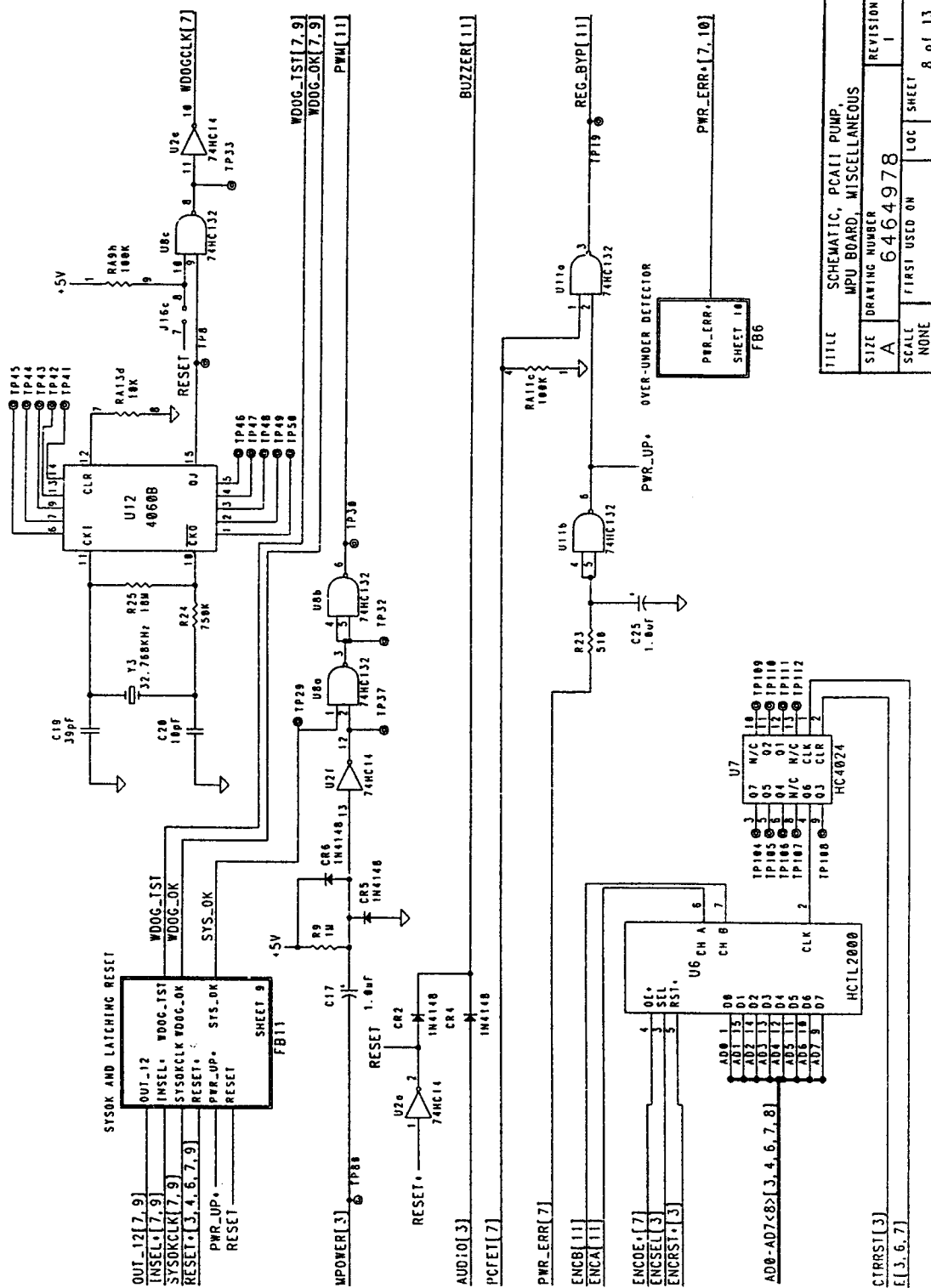
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TITLE SCHEMATIC, PCA11 PUMP, MPU BOARD, ASIC			
SIZE	DRAWING NUMBER	REVISION	
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SCALE	FIRST USED ON	LOC	SHEET
NONE			7 of 13

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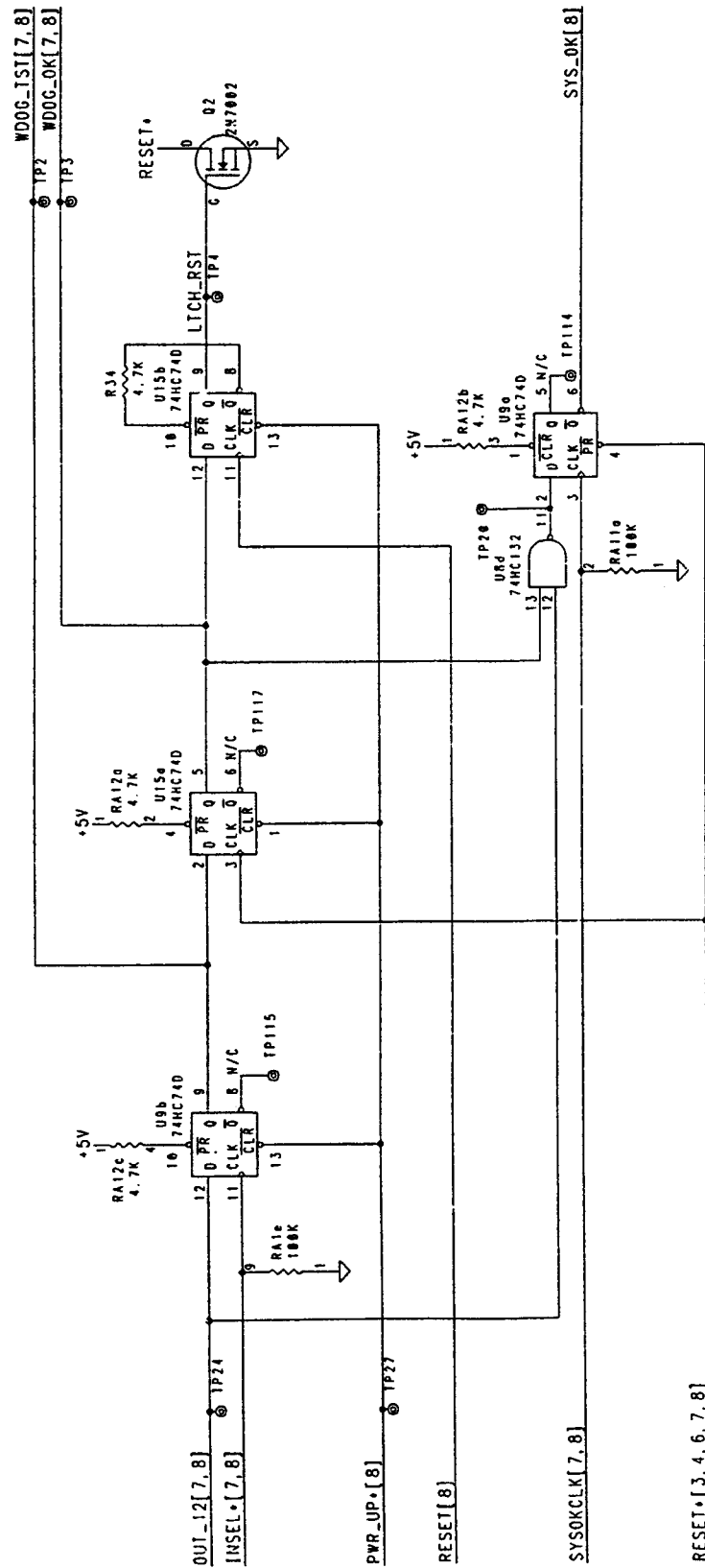
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TITLE				SCHEMATIC, MPU BOARD, MISCELLANEOUS			
SIZE				DRAWING NUMBER			
A				6464978			
SCALE				FIRST USED ON			
NONE				LOC			
				SHEET			
				8 of 13			

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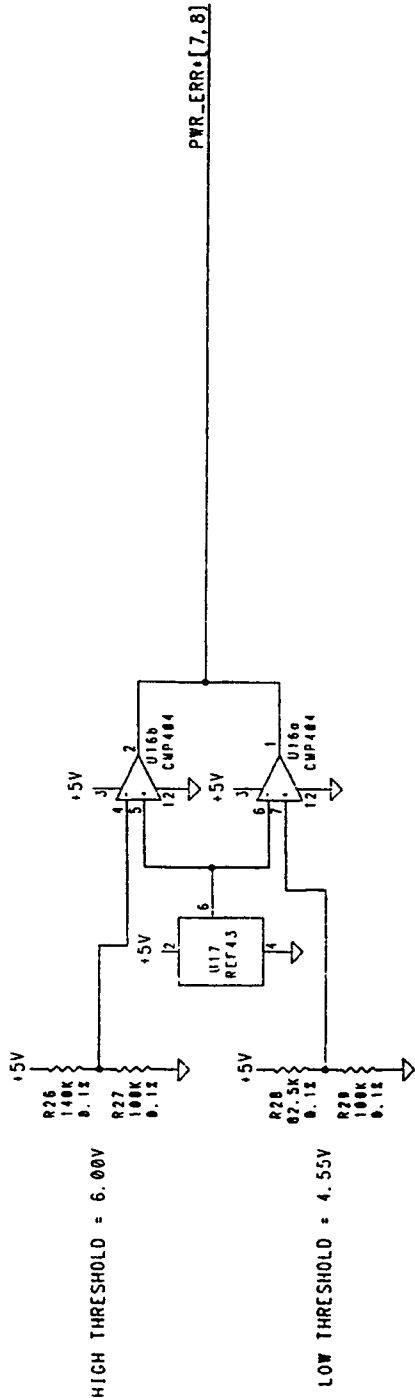
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TITLE SCHEMATIC, PCA11 PUMP,			
MPU BOARD, SYS OK & LATCHING RESET			
SIZE	DRAWING NUMBER	REVISION	
A	6464978	1	
SCALE	FIRST USED ON	LOC	SHEET
NONE			9 of 13

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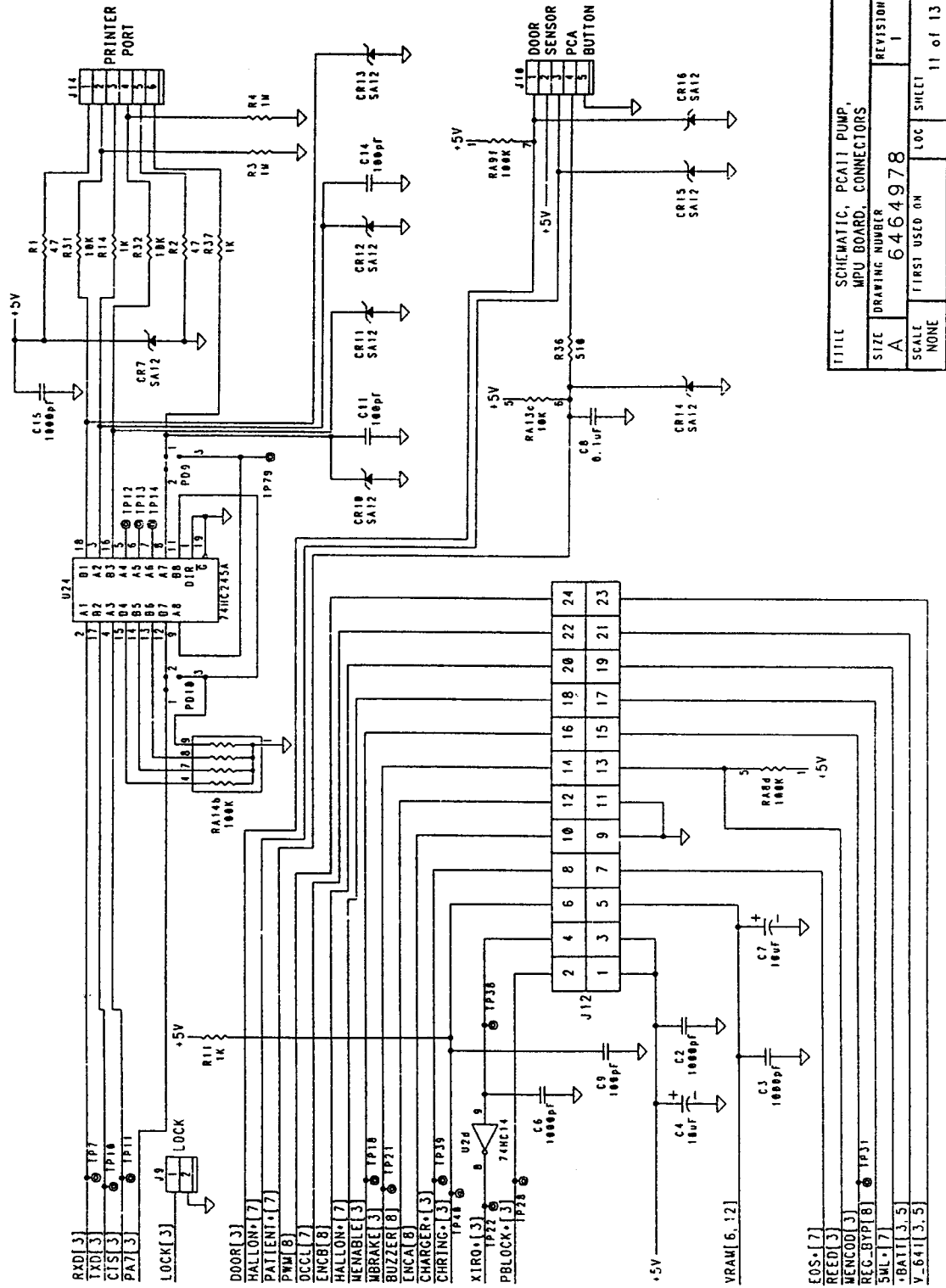
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TITLE SCHEMATIC, PCA11 PUMP, MPU BOARD, OVER-UNDER DETECTOR			
SIZE A	DRAWING NUMBER 6464978	REVISION 1	
SCALE NONE	FIRST USED ON LOC	SHEET 10 of 13	

NOTICE - CONFIDENTIAL/PROPRIETARY INFORMATION

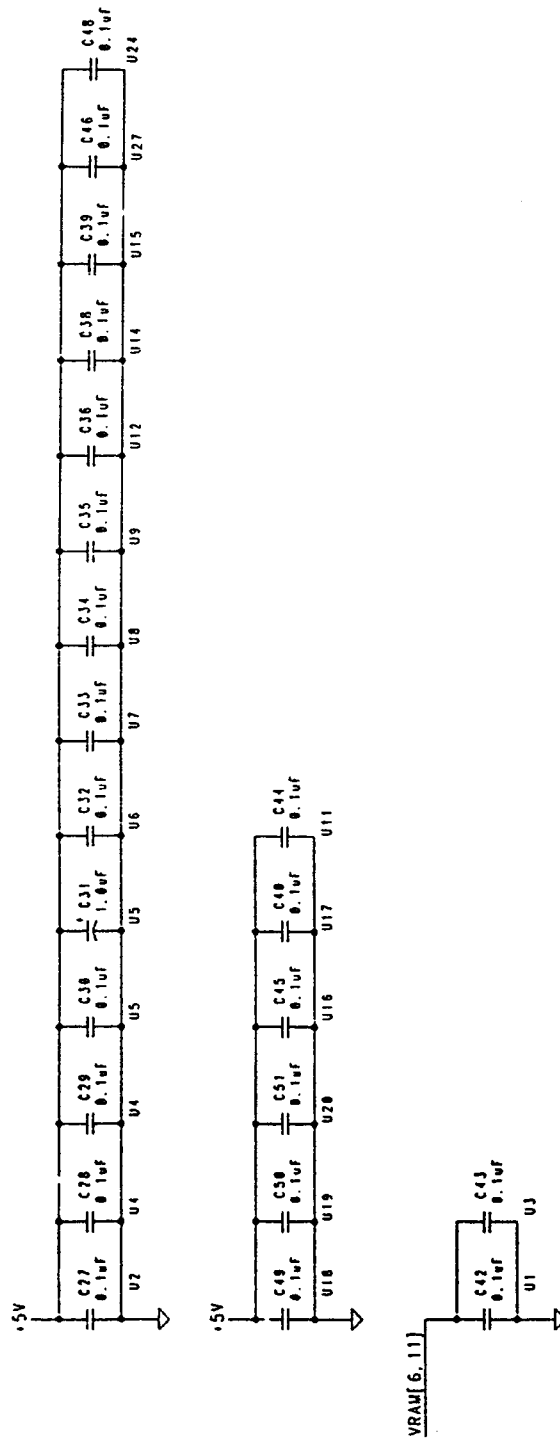
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TITLE	SCHEMATIC, PCA11 MPU BOARD, CONNECTORS
SIZE	DRAWING NUMBER
A	6464978
SCALE	FIRST USED ON
NONE	LOC
	SHEET
	11 of 13

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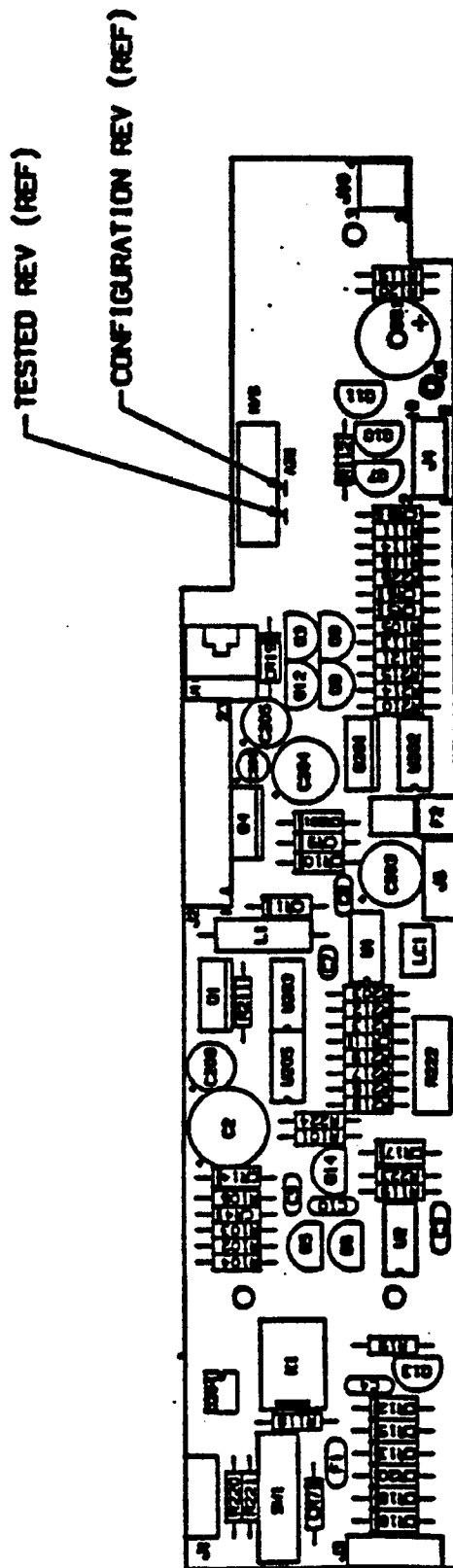


TITLE SCHEMATIC, PCA11 PUMP, MPU BOARD, BYPASS CAPS			
SIZE A	DRAWING NUMBER 6464978	REVISION 1	
SCALE NONE	FIRST USED ON	LOC SHEET	12 of 13

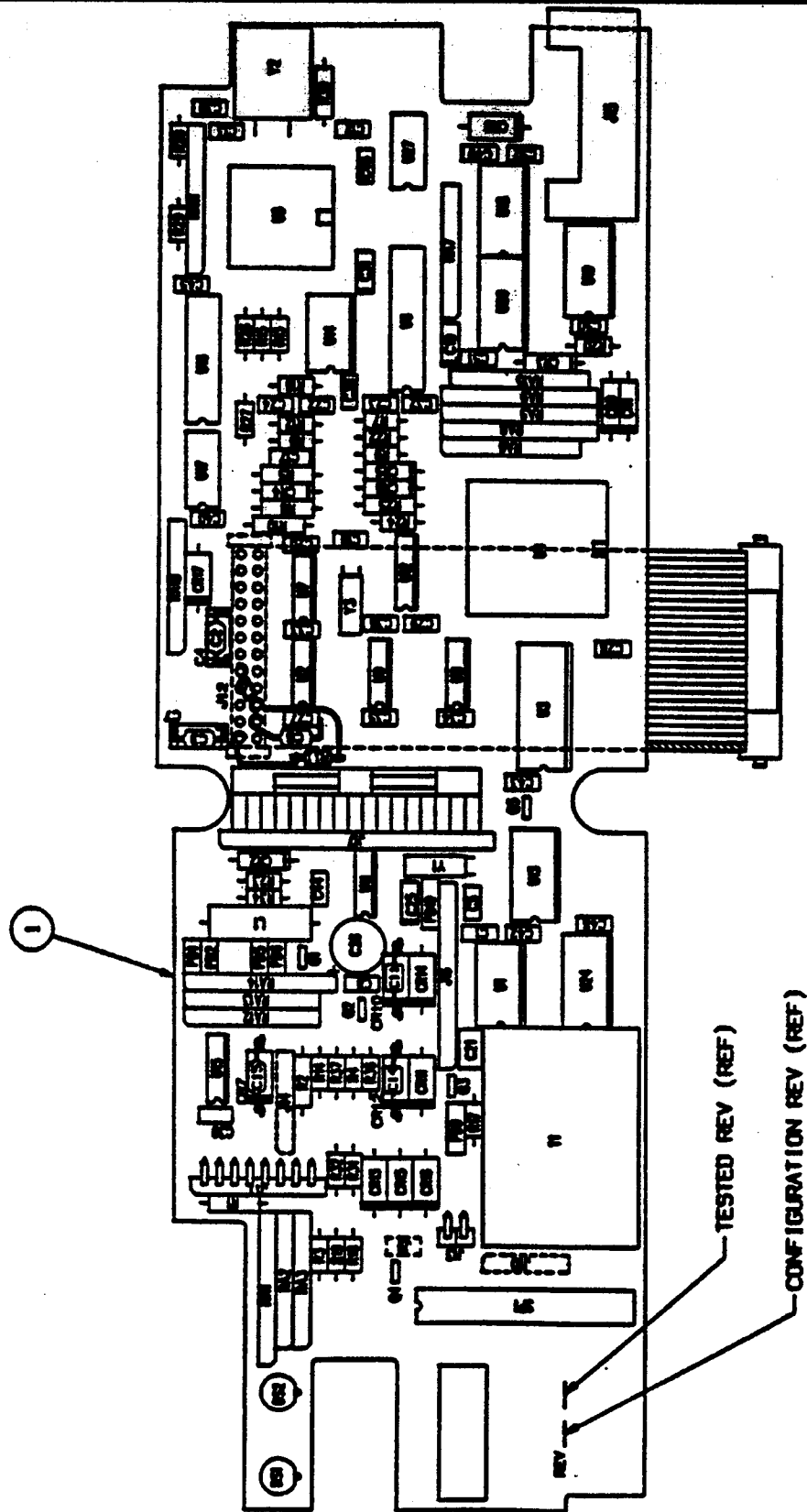
B.1 GENERAL

This appendix contains the circuit board assembly drawings for the PCA II Pump. A table of contents for this section is shown below:

Drawing Number	Description
6464895	ASSY, PCB MECHANISM PCA II PUMP
6464980	ASSY, PCB A1 MPU FINAL PCA II PUMP



6464895 ASSY, PCB MECHANISM PCA II PUMP



6464980 ASSY, PCB A1 MPU FINAL PCA II PUMP

C.1 GENERAL

This appendix contains a part listing of the components of the PCA II Pump. There are three part list types contained in this appendix, by major component, alphabetical, and numerical. The numerical and alphabetical lists are cross referenced to the assembly specific parts list by figure and index number.

C.2 ASSEMBLY PART LISTINGS

This section contains a part listing by major assembly. A listing of the major assemblies is shown below:

- Syringe Cover
- Rear Case Half
- Labeling and Miscellaneous Hardware
- Front Case Half
- Front Panel Assembly
- Mechanism Assembly
- EOS and 5 mL switch assembly
- Syringe Block Assembly

C.2.1 Syringe Cover

Table C-1 Syringe Cover Parts

Figure ID Number	Part Description	Baxter Part Number	Quantity per Assembly
1	Syringe Cover Assembly	6464611RP	1
2	#4-40 x 1/4" Pan Head Screws	5101174	4
3	#4 Split Lock Washers	5110048	4

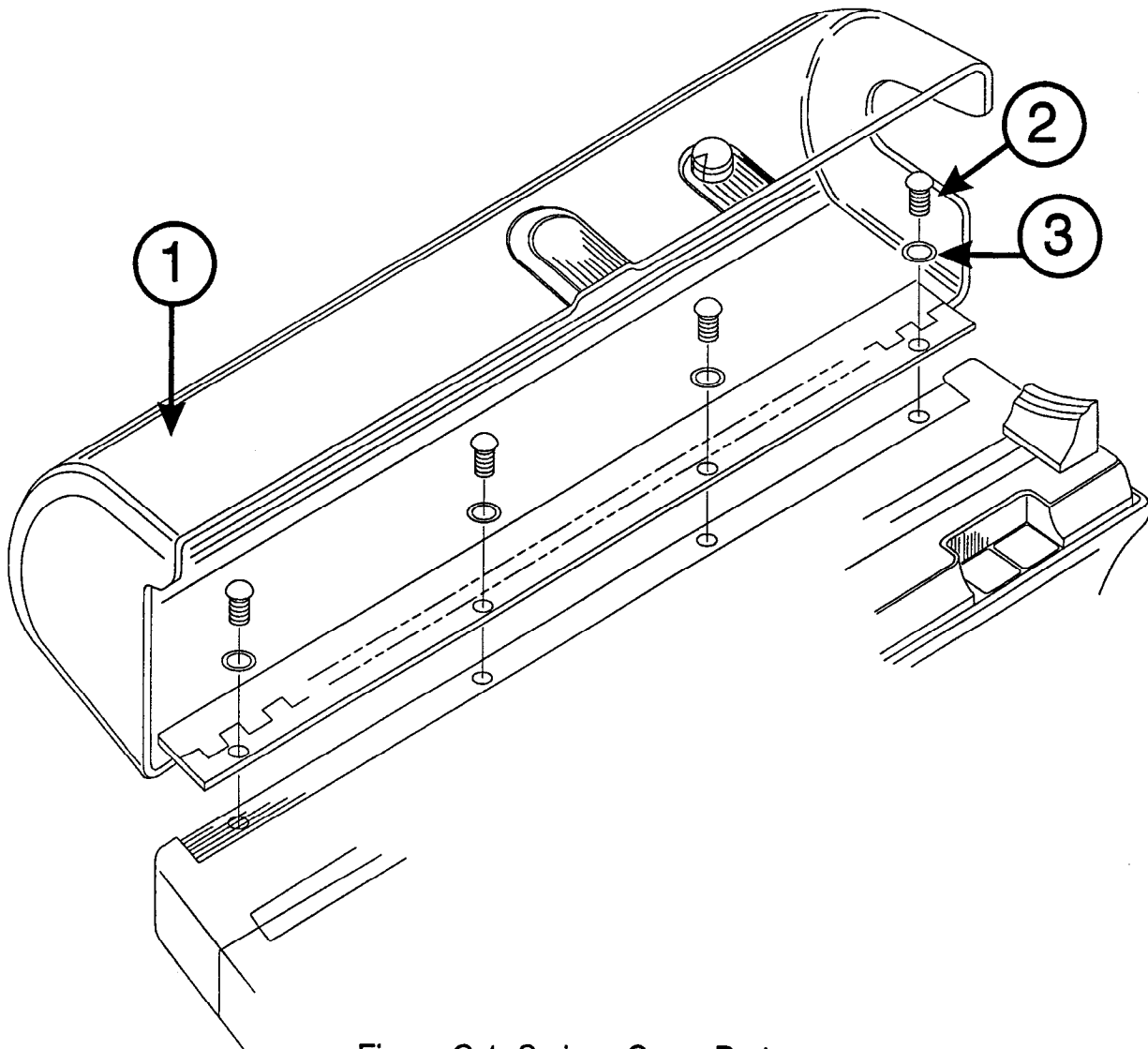


Figure C-1 Syringe Cover Parts

C.2.2 Rear Case Half

Table C-2 Rear Case Half Parts

Figure ID Number	Part Description	Baxter Part Number	Quantity per Assembly
4	Rear Case Assembly Complete (Includes items 5-10, 12-16)	6464939RP	1
5	Tape Foam Neoprene	5020174	1
6	Polyurethane Seal	6461434	1
7	1/16" Sponge Neoprene Tape	5020190	1
8	Polarity Label	5020169	1
9	Battery Door Retainer	6464624	1

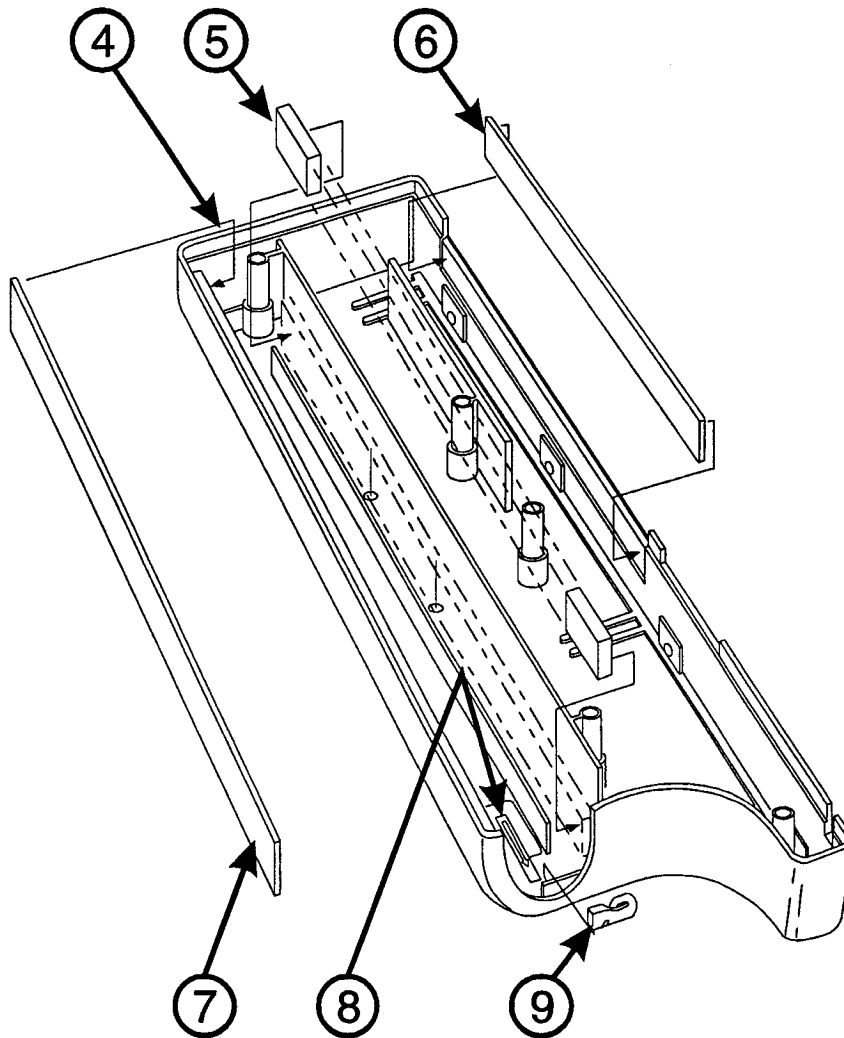


Figure C-2 Rear Case Half Parts

C.2.3 Labeling and Miscellaneous Hardware

Table C-3 Labeling and Miscellaneous Hardware

Figure ID Number	Part Description	Baxter Part Number	Quantity per Assembly
10	Rear Label	6464198	1
11	#4-40 x 1¼" Pan Head Screws	5101179	5
12	Mounting Plate	6461021	1
13	#4-40 x ¾" Self Tapping Screw	5101014	4
14	Lockwasher	5140008	4
15	Fuse Window Label	6464806	1
16	Fuse Window	6464807	1
17	Fuse, ¼ AMP, 125 V	5146895	1
18	Support Disc	6464665	1
19	#4-40 x ½" Self Tapping Screw	5137039	2
20	Syringe Loading Label	6464647	1
21	Syringe Flange Label	6464445	1
22	Syringe Holder Assembly	6461431	1
23	Syringe Warning Label	6461138A	1

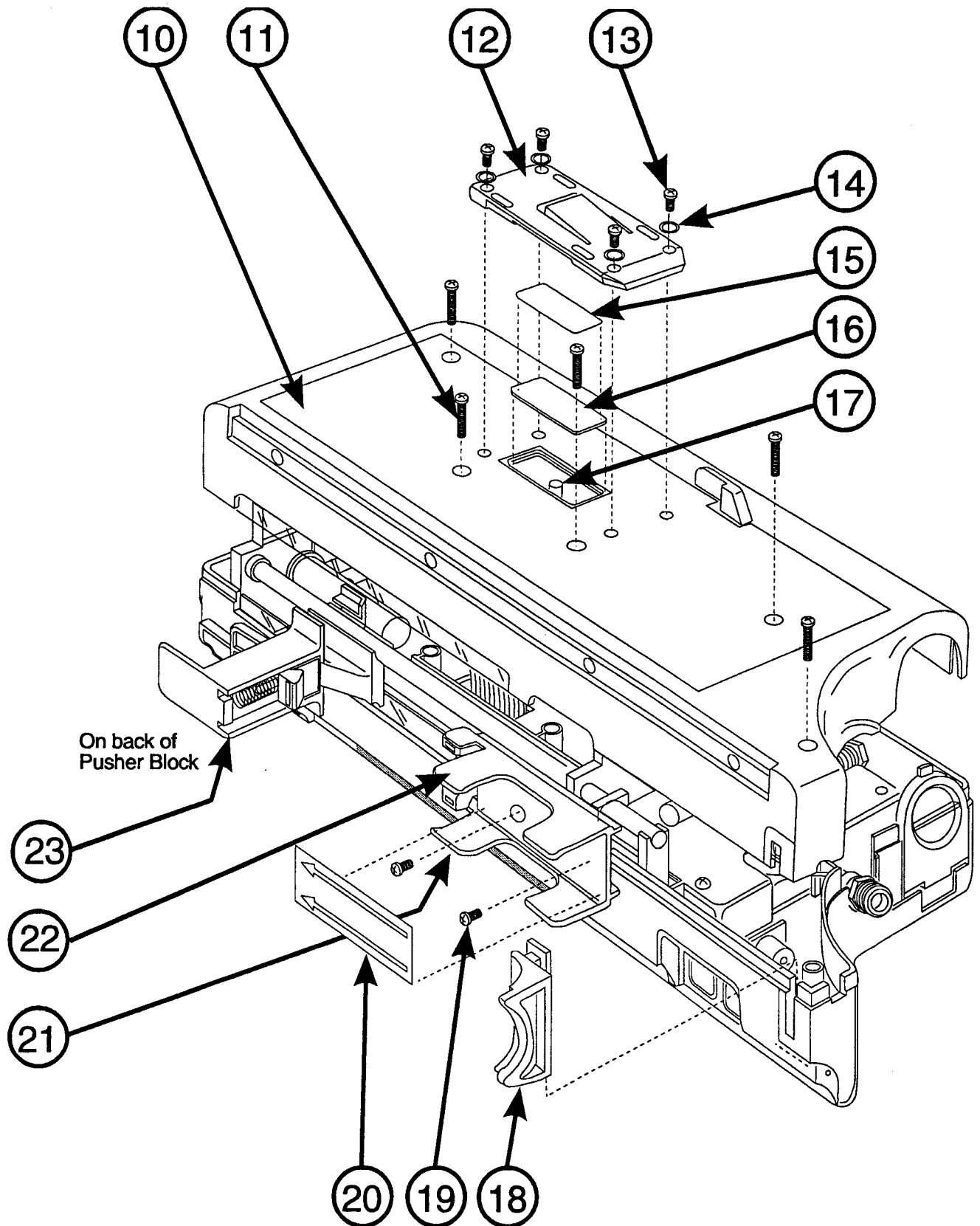


Figure C-3 Labeling and Miscellaneous Hardware

C.2.4 Front Case Half Parts

Table C-4 Front Case Half Parts

Figure ID Number	Part Description	Baxter Part Number	Quantity per Assembly
24	Front Case Assembly Complete (Includes Items 25, 26, 28-30, 37-40)	6464940RP	1
25	Polyurethane Seal	6461434	1
26	Tape, Foam Neoprene	5020174	1
27	Battery Spring Assembly	6464833RP	1
28	Printer Label	6464695	1
29	Cable Tie	5113821	1
30	Battery Door Keeper	6464625	1
31	Battery Door Assembly	6464943RP	1
32	Assembly Printer Connector	6464683RP	1
33	Dust Cover	5146808	2
34	Power Pack Connector Assembly	6464814RP	1
35	Contact, Charge Ring	6464799	1
36	Patient Control Connector Assembly	6464942RP	1
37	Magnetic Pin	6464558	1
38	ON/OFF Keypad	6464598	1
39	Warning Label	6464681	1
40	Cartridge Guide	6464549	1

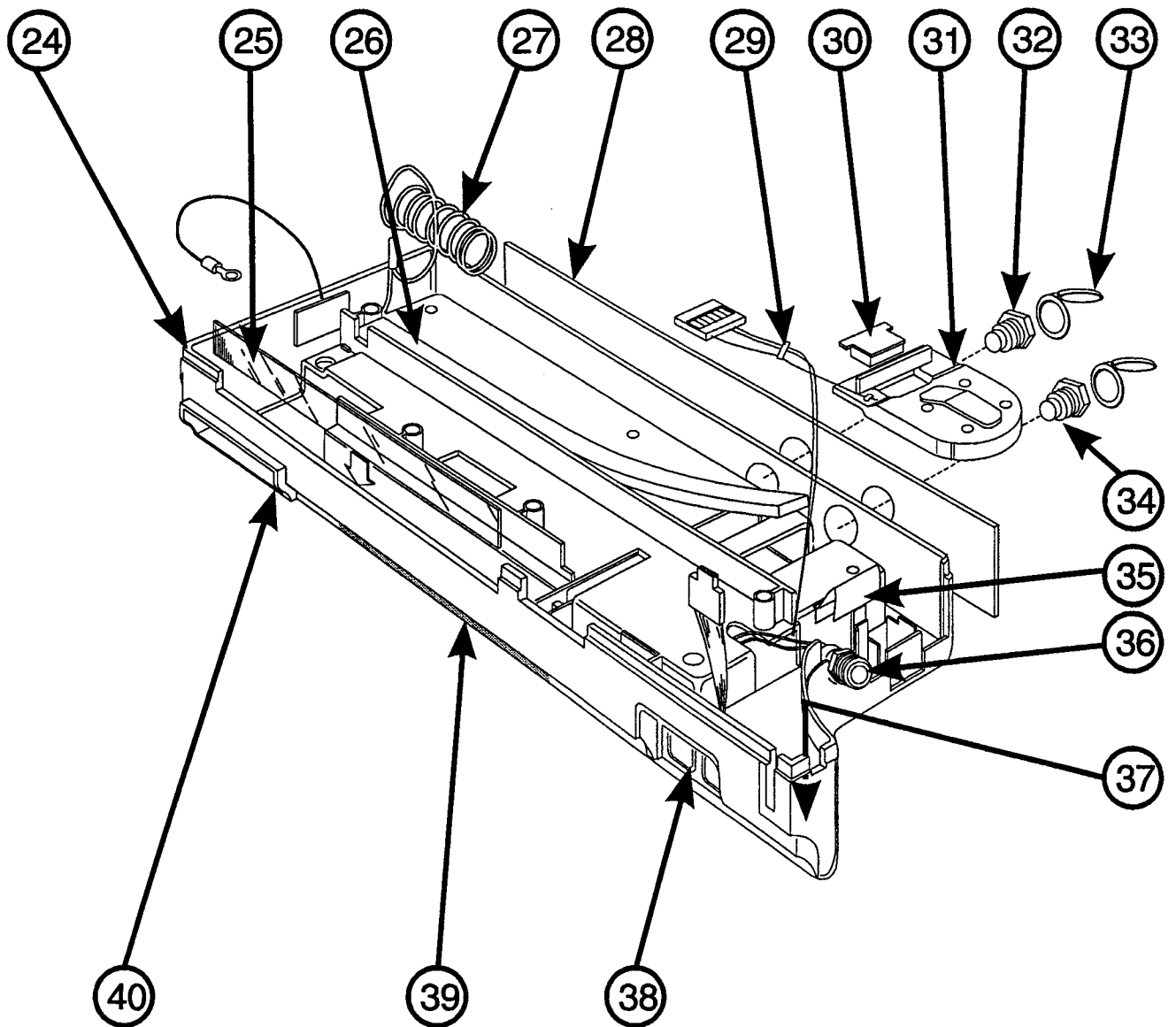


Figure C-4 Front Case Half Parts

C.2.5 Front Panel Assembly

Table C-4 Front Panel Assembly

Figure ID Number	Part Description	Baxter Part Number	Quantity per Assembly
41	MPU Board	6464980	1
42	4-40 x ¼" Self Tapping Screw	5101167	4
43	4-40 x ¾" Pan Head Screw	5101104	6
44	Red LED	010600008	1
45	Green LED	010600007	1
46	#2-56 x 7/16" Pan Head Screw	5101165	3
47	Keyswitch Assembly	6464572RP	1
48	Cam Lock Lever	6464515	1
49	Syringe Cover Lock	6464678	1
50	Extension Lock Lever	6464514	1
51	Stand Off	5125113	3
52	LCD Window	6464981	1
53	LCD Module Assembly	6464880RP	1
54	Keypad	6464195	1
55	Case Front Cover	6464633	1

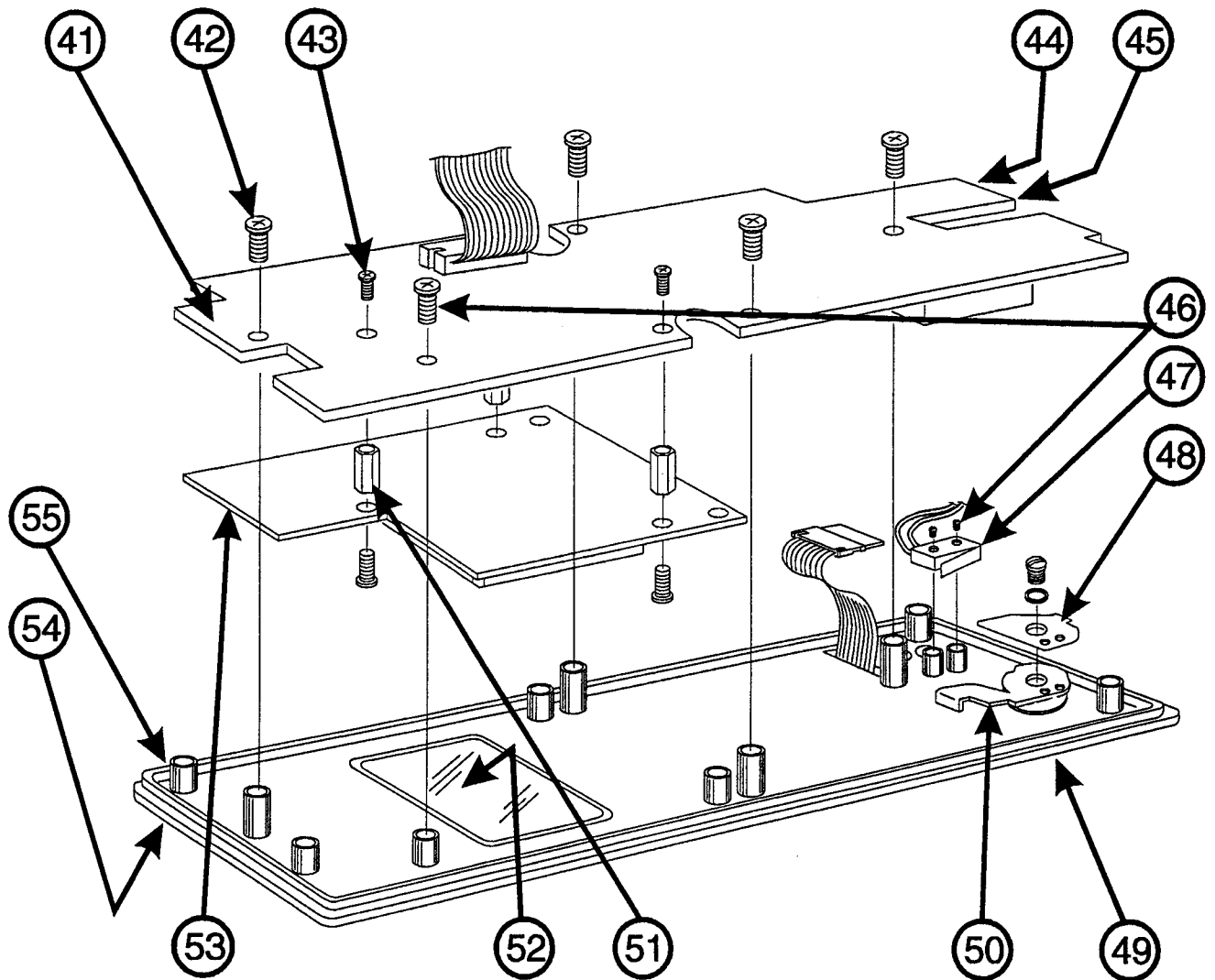


Figure C-5 Front Panel Assembly

C.2.6 Mechanism Assembly

Table C-5 Mechanism Assembly Parts

Figure ID Number	Part Description	Baxter Part Number	Quantity per Assembly
56	#4-40 x 1/8" Set Screw	5115054	2
57	Motor Pillow Block	6464627	1
58	Nylon Washer	5014035	1
59	Pusher Block Assembly (with sensor)	6464934RP	1
60	5 mL/EOS Switch Assembly (Refer to C.2.7)		1
61	#4 Split Lock Washer	5140008	2
62	#4-40 x 1/4" Pan Head Screw	5101061	5
63	#4-40 x 1/4" Pan Head Screw	5101166	5
64	Guide Rod	6461424	1
65	Flange Bearing	5011037	1
66	Threaded Bushing	6461110	1
67	Middle Pillow Block	6464628	1
68	Occlusion Switch	5146626	1
69	Roll Pin	5107011	1
70	Buzzer	5146778	1
71	Mechanism Board	6464895	1
72	Motor	5123286	1
73	#2 Internal Tooth Lock Washer	5141009	2
74	Reed Switch Assembly	6464621RP	1
75	M2 x 6MM Pan Head Screw	5101164	2
76	Lead Screw Assembly	6464623RP	1

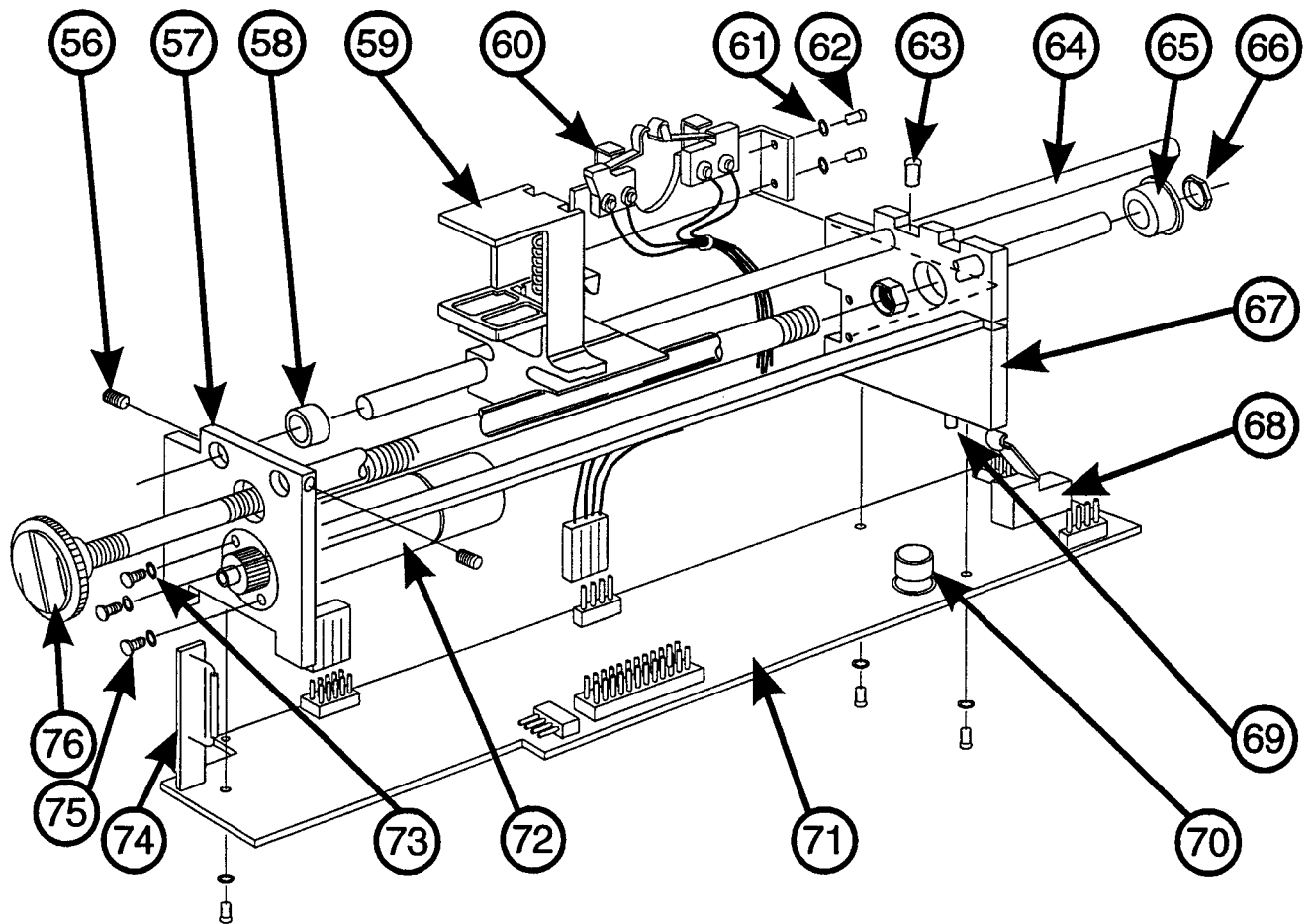


Figure C-6 Mechanism Assembly Parts

C.2.7 EOS and 5 mL Switch Assembly

Table C-7 EOS and 5 mL Switch Assembly Parts

Figure ID Number	Part Description	Baxter Part Number	Quantity per Assembly
77	#2-56 x ½" Pan Head Screw	5101116	4
78	#2 Internal Tooth Lock Washer	5143011	8
79	EOS (Microswitch) Bracket	6464655	1
80	EOS Switch Insulator	6464599	1
81	EOS Microswitch	5112081	1
82	#2-56 Hex Nut	5135001	4
83	4 Position Male Connector	010135043	1
84	Cable Tie	5113821	1
85	5 mL Microswitch	021000021	1

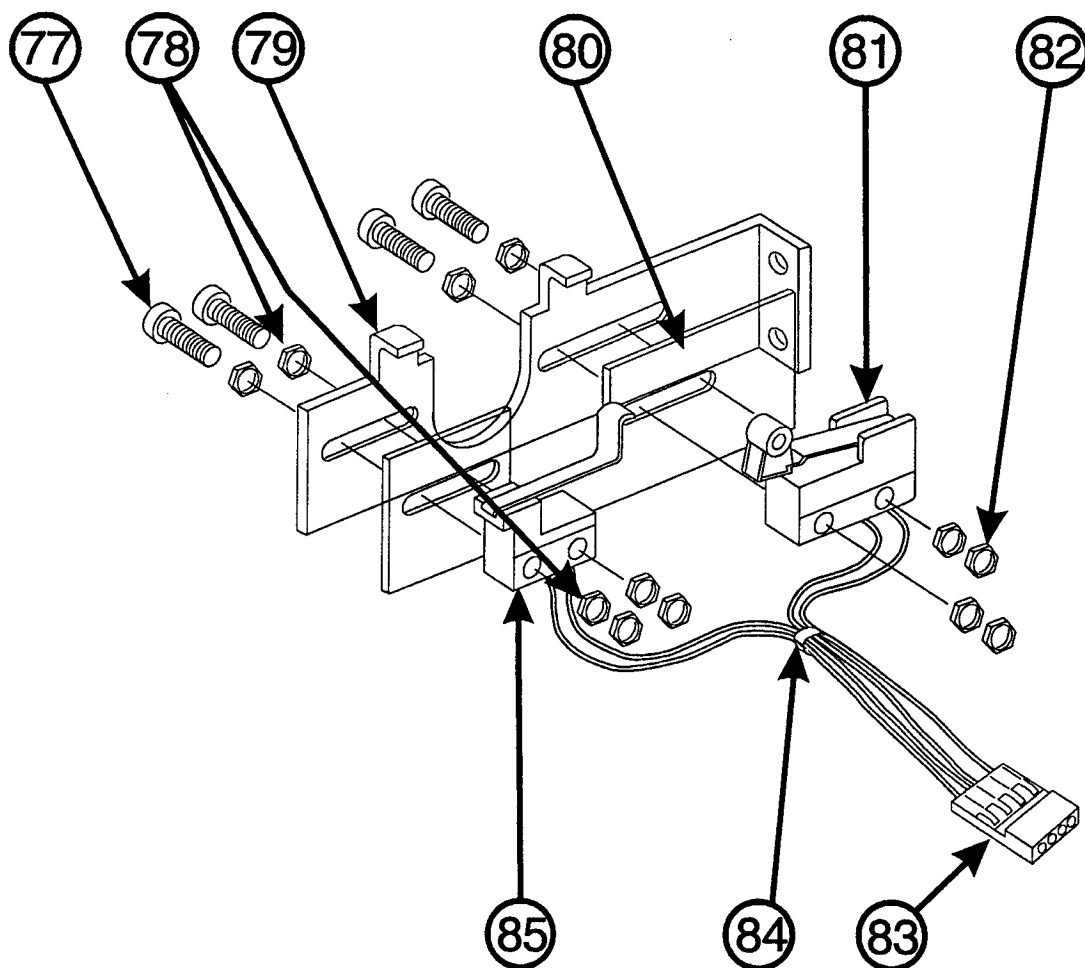


Figure C-7 EOS and 5 mL Switch Assembly Parts

C.2.8 Syringe Block Assembly

Table C-8 Syringe Block Assembly Parts

Figure ID Number	Part Description	Baxter Part Number	Quantity per Assembly
86	#4-40 x 3/8" Pan Head Screw	5101014	2
87	Limit Collar	6461321	2
88	Syringe Block	6465169	1
89	Preload Spring	5009080	1

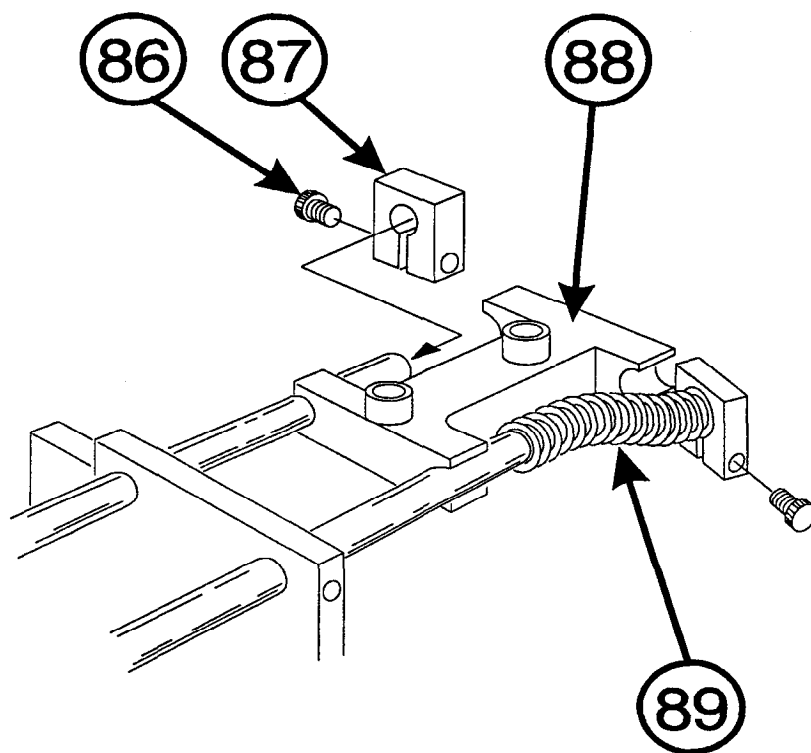


Figure C-8 Syringe Block Assembly Parts

C.3 APLPHABETICAL PARTS LIST

Description	Baxter Part Number	Figure Number	Index Number	Unit Qty
#2 Internal Tooth Lock Washer	5141009	REF	REF	10
#2-56 x 1/2" Pan Head Screw	5101116	C-7	76	2
#2-56 x 7/16" Pan Head Screw	5101165	C-5	46	3
#2-56 Hex Nut	5135001	C-7	82	4
#4 Split Lock Washer	5140008	REF	REF	5
#4-40 x 3/8" Pan Head Screw	5101014	REF	REF	4
#4-40 x 1/4" Pan Head Screw	5101174	REF	REF	14
#4-40 x 3/16" Pan Head Screw	5101104	C-5	43	6
#4-40 x 1-1/4" Pan Head Screw	5101179	C-3	11	5
#4-40 x 1/8" Set Screw	5115054	C-6	56	2
#4-40 x 1/4" Self Tapping Screw	5101167	C-5	42	4
#4-40 x 3/8" Self Tapping Screw	5101014	C-3	13	4
#4-40 x 1/2" Self Tapping Screw	5137039	C-3	19	2
1/16" Sponge Neoprene Tape	5020190	C-2	7	1
4 Position Male Connector	010135043	C-7	83	1
5 mL Microswitch	021000021	C-4	85	1
Assembly Printer Connector	6464683RP	C-4	32	1
Battery Door Assembly	6464943RP	C-4	37	1
Battery Door Keeper	6464625	C-4	36	1
Battery Door Retainer	6464624	C-2	9	1
Battery Spring Assembly	6464833RP	C-4	27	1
Buzzer	5146778	C-6	70	1
Cable Tie	5113821	REF	REF	2
Cam Lock Lever	6464515	C-5	48	1
Cartridge Guide	6464549	C-4	41	1
Case Front Cover	6464633	C-5	55	1
Contact, Charge Ring	6464799	C-4	35	1
Dust Cover	5146808	C-7	33	2
EOS Bracket	6464655	C-7	79	1
EOS Microswitch	5112081	C-7	81	1
EOS Switch Insulator	6464599	C-7	80	1
Extension Lock Lever	6464514	C-5	50	1
Flange Bearing	5011037	C-6	65	1
Front Case Assembly	6464940RP	C-4	24	1
Fuse, 6/10A, 125 V	5146895	C-3	17	1
Fuse Window	6464807	C-3	16	1
Fuse Window Label	6464806	C-3	15	1
Green LED	010600007	C-5	45	1
Guide Rod	6461424	C-6	64	1

C.3 APLPHABETICAL PARTS LIST (CONTINUED)

Description	Baxter Part Number	Figure Number	Index Number	Unit Qty
Keypad	6464195	C-5	44	1
Keyswitch Assembly	6464572RP	C-5	47	1
LCD Module Assembly	6464880RP	C-5	53	1
LCD Window	6464981	C-4	52	1
Lead Screw Assembly	6464623RP	C-6	76	1
Limit Collar	6461321	C-8	87	1
Lock Washer	5140008	C-3	14	4
M2 x 6MM Pan Head Screw	5101164	C-6	75	2
Magnetic Pin	6464558	C-4	38	1
Mechanism Board	6464895	C-6	71	1
Middle Pillow Block	6464628	C-6	67	1
Motor	5123286	C-6	72	1
Motor Pillow Block	6464627	C-5	57	1
Mounting Plate	6461021	C-3	12	1
MPU Board	6464980	C-5	41	1
Nylon Washer	5014035	C-6	58	1
Occlusion Switch	5146626	C-6	68	1
On/Off Keypad	6464598	C-4	39	1
Patient Control Connector Assembly	6464942RP	C-4	31	1
Polarity Label	5020169	C-2	8	1
Polyurethane Seal	6461434	REF	REF	2
Power Pack Connector Assembly	6464814RP	C-4	34	1
Preload Spring	5009080	C-8	89	1
Printer Label	6464695	C-4	29	1
Pusher Block Assembly (with sensor)	6464934RP	C-6	59	1
Rear Case Assembly Complete	6464939RP	C-2	4	1
Rear Label	6464198	C-3	10	1
Red LED	010600008	C-5	44	1
Reed Switch Assembly	6464621RP	C-6	74	1
Roll Pin	5107011	C-6	69	1
Stand Off	5125113	C-5	51	3
Support Disc	6464665	C-3	18	1
Syringe Block	6465169	C-8	88	1
Syringe Cover Assembly	6464611RP	C-1	1	1
Syringe Cover Lock	6464678	C-5	49	1
Syringe Flange Label	6464445	C-3	21	1
Syringe Holder Assembly	6461431	C-3	22	1
Syringe Loading Label	6464647	C-3	20	1
Syringe Warning Label	6461138A	C-3	23	1

C.3 APLPHABETICAL PARTS LIST (CONTINUED)

Description	Baxter Part Number	Figure Number	Index Number	Unit Qty
Tape Foam Neoprene	5020174	REF	REF	AR
Threaded Bushing	6461110	C-6	66	1
Warning Label	6464681	C-4	40	1

C.4 NUMERICAL PARTS LIST

Baxter Part Number	Description	Figure Number	Index Number	Unit Qty
5009080	Preload Spring	C-8	89	1
5011037	Flange Bearing	C-6	65	1
5014035	Nylon Washer	C-6	58	1
5020169	Polarity Label	C-2	8	1
5020174	Tape Foam Neoprene	REF	REF	AR
5020190	1/16" Sponge Neoprene Tape	C-2	7	1
5101014	#4-40 x 3/8" Pan Head Screw	REF	REF	4
5101014	#4-40 x 3/8" Self Tapping Screw	C-3	13	4
5101104	#4-40 x 3/16" Pan Head Screw	C-5	43	6
5101116	#2-56 x 1/2" Pan Head Screw	C-7	77	2
5101164	M2 x 6MM Pan Head Screw	C-6	75	2
5101165	#2-56 x 7/16" Pan Head Screw	C-5	46	2
5101167	#4-40 x 1/4" Self Tapping Screw	C-5	42	5
5101174	#4-40 x 1/4" Pan Head Screw	REF	REF	14
5101179	#4-40 x 1-1/4" Pan Head Screw	C-3	11	5
5107011	Roll Pin	C-6	69	1
5112081	EOS Microswitch	C-7	81	1
5115054	#4-40 x 1/8" Set Screw	C-6	56	1
5123286	Motor	C-6	72	1
5125113	Stand Off	C-5	51	3
5135001	#2-56 Hex Nut	C-7	82	4
5137039	#4-40 x 1/2" Self Tapping Screw	C-3	19	2
5140008	#4 Split Lock Washer	REF	REF	5
5141009	#2 Internal Tooth Lock Washer	REF	REF	10
5113821	Cable Tie	REF	REF	2
5146626	Occlusion Switch	C-6	68	1
5146778	Buzzer	C-6	70	1
5146808	Dust Cover	C-7	33	2
5146895	Fuse, 6/10A, 125 V	C-3	17	1
6461021	Mounting Plate	C-3	12	1
6461110	Threaded Bushing	C-6	66	1
6461138A	Syringe Warning Label	C-3	23	1
6461321	Limit Collar	C-8	87	1
6461424	Guide Rod	C-6	64	1
6461431	Syringe Holder Assembly	C-3	22	1
6461434	Polyurethane Seal	REF	REF	2
6464195	Keypad	C-5	54	1
6464198	Rear Label	C-3	10	1
6464445	Syringe Flange Label	C-3	21	1

C.4 NUMERICAL PARTS LIST (CONTINUED)

Baxter Part Number	Description	Figure Number	Index Number	Unit Qty
6464514	Extension Lock Lever	C-5	50	1
6464515	Cam Lock Lever	C-5	48	1
6464549	Cartridge Guide	C-4	41	1
6464558	Magnetic Pin	C-4	38	1
6464572RP	Keyswitch Assembly	C-5	47	1
6464598	On/Off Keypad	C-4	39	1
6464599	EOS Switch Insulator	C-7	80	1
6464611RP	Syringe Cover Assembly	C-1	1	1
6464621RP	Reed Switch Assembly	C-6	74	1
6464623RP	Lead Screw Assembly	C-6	76	1
6464624	Battery Door Retainer	C-2	9	1
6464625	Battery Door Keeper	C-4	36	1
6464627	Motor Pillow Block	C-5	57	1
6464628	Middle Pillow Block	C-6	67	1
6464633	Case Front Cover	C-5	55	1
6464647	Syringe Loading Label	C-3	20	1
6464655	EOS Bracket	C-7	79	1
6464665	Support Disc	C-3	18	1
6464678	Syringe Cover Lock	C-5	49	1
6464681	Warning Label	C-4	40	1
6464683RP	Assembly Printer Connector	C-4	32	1
6464695	Printer Label	C-4	29	1
6464799	Contact, Charge Ring	C-4	35	1
6464806	Fuse Window Label	C-3	15	1
6464807	Fuse Window	C-3	16	1
6464833RP	Battery Spring Assembly	C-4	27	1
6464880RP	LCD Module Assembly	C-5	53	1
6464895	Mechanism Board	C-6	71	1
6464934RP	Pusher Block Assembly (with sensor)	C-6	59	1
6464939RP	Rear Case Assembly Complete	C-2	4	1
6464940RP	Front Case Assembly	C-4	24	1
6464942RP	Patient Control Connector Assembly	C-4	31	1
6464943RP	Battery Door Assembly	C-4	37	1
6464980	MPU Board	C-5	41	1
6464981	LCD Window	C-4	52	1
6465169	Syringe Block	C-8	88	1
010135043	4 Position Male Connector	C-7	83	1

C.4 NUMERICAL PARTS LIST (CONTINUED)

Baxter Part Number	Description	Figure Number	Index Number	Unit Qty
010600007	Green LED	C-5	45	1
010600008	Red LED	C-5	44	1
021000021	5 mL Microswitch	C-7	85	1

D.1 GENERAL

This appendix describes major updates to the PCA II Pump. The updates are listed by serial number and/or hardware revision number of when the change occurred. In many instances a different part number is assigned for compatibility reasons. To ensure proper fit and operation of parts, make sure that you check all updates that may apply to a particular serial number.

PRODUCT UPDATE 1***Pumps Affected***

All units labeled as Hardware Revision 4.4 or above.

Update Description

Changed circuitry on the MPU and Mechanism circuit boards. Changed configuration of the buzzer assembly.

Differences

The buzzer is removed from the MPU circuit board and is now located on the front case half assembly. Pumps of this configuration can be identified by a Hardware Revision level of 4.4 or above. Revised schematics and circuit board assembly drawings are included as part of this update.

Part Changes

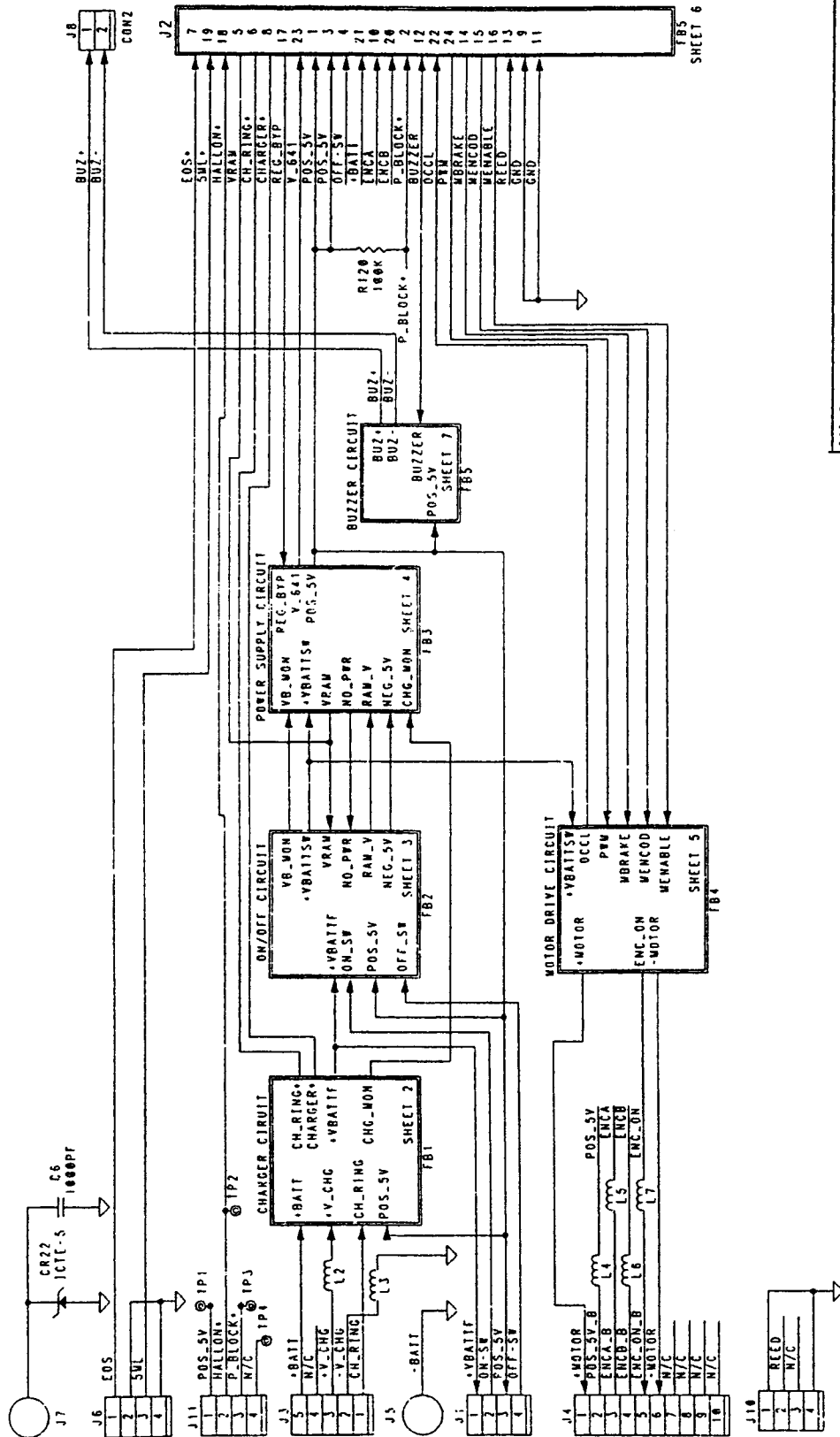
<u>Description</u>	<u>Figure Number</u>	<u>Index Number</u>	<u>New Part Number</u>
MPU Circuit Board	C-5	41	6470124
Mechanism Circuit Board	C-6	71	6470120
Buzzer Assembly	C-6	70	6464094RP
Cable Assembly	N/A	N/A	6464091RP
Front Case W/Buzzer Assembly	C-4	24	6464089RP

The schematics and assembly drawings that follow are part of Product Update 1. A table of contents for this section is shown below:

Drawing Number	Description
6470119	SCHEMATIC, PCA II PUMP, MECHANISM BOARD, ESD
6470128	SCHEMATIC, PCA II PUMP, MPU BOARD, ESD
6470120	ASSY, PCB MECHANISM ESD PCA II
6470124	ASSY, PCB A1 MPU ESD FINAL PCA II

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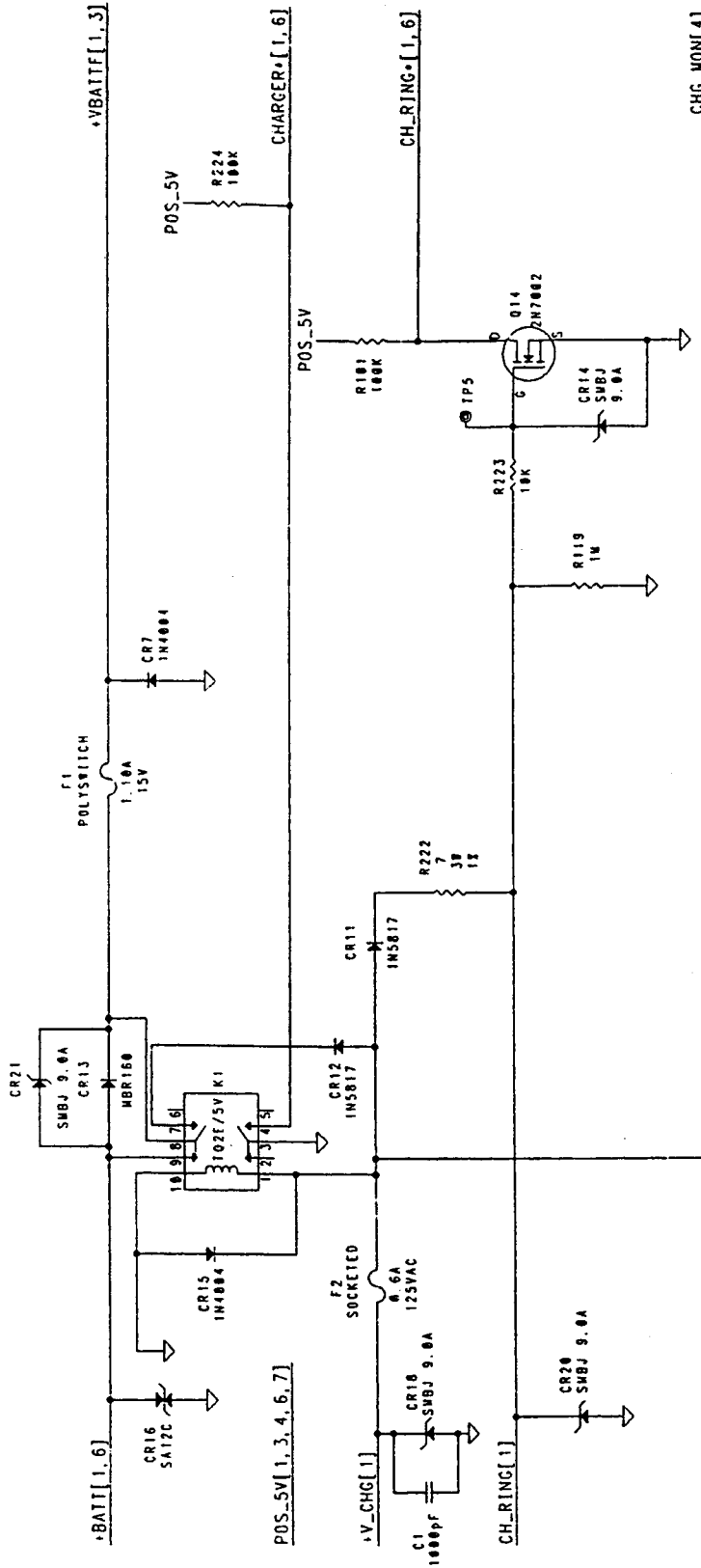


TITLE			
SCHEMATIC, PCA11 PUMP, MECHANISM BOARD, ESD			
SIZE	DRAWING NUMBER	REVISION	
A	6470119	1	
SCALE	FIRST USED ON	LOC	SHEET
NONE			1 OF 7

- NOTES:
1. UNLESS OTHERWISE SPECIFIED, ALL RESISTORS ARE 1/4W, 5% AND RESISTANCE VALUES ARE IN OHMS.
 2. TERMINAL NUMBERING FOR J2 AND J4 ARE FOR REFERENCE ONLY. SEE FIGURE A(J2) OR B(J4) FOR TERMINAL LOCATION.
 3. [N] - A NUMBER IN BRACKETS INDICATES THE PAGE(S) TO WHICH THE SIGNAL CONNECTS.

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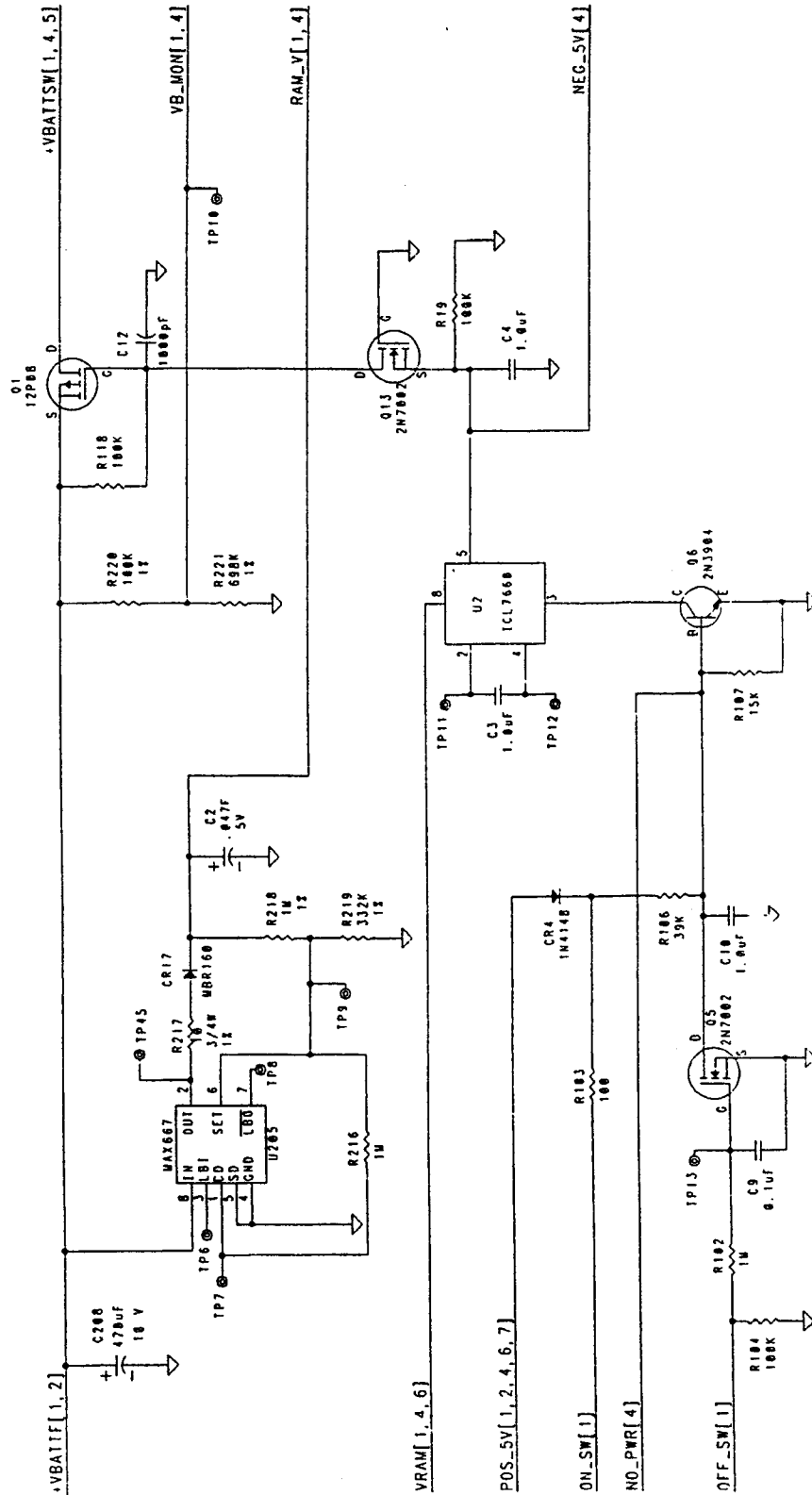
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TITLE			
SCHEMATIC, PCA11 PUMP			
MECHANISM BOARD, CHARGER CIRCUIT			
SIZE	DRAWING NUMBER	REVISION	
A	6470119	1	
SCALE	FIRST USED ON	LOC	SHEET
NONE			2 OF 7

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TITLE			
SCHEMATIC, PCA11 PUMP			
MECHANISM BOARD, ON-OFF CIRCUIT			
SIZE	DRAWING NUMBER	REVISION	
A	6470119	1	
SCALE	FIRST USED ON	LOC	SHEET
NONE			3 OF 7

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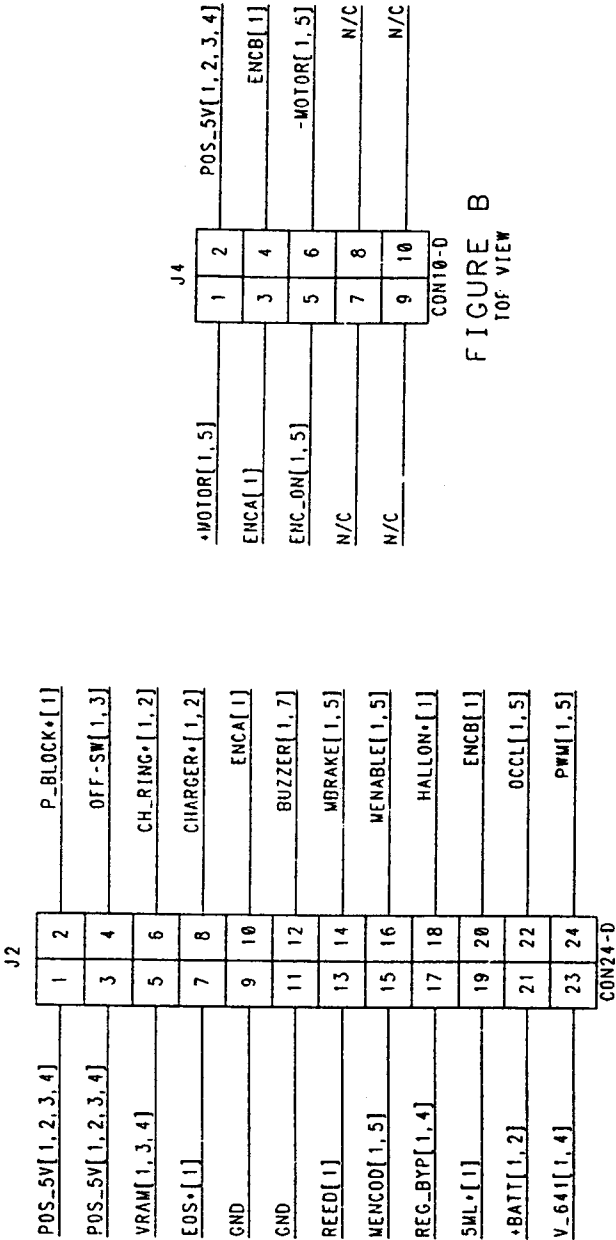


FIGURE A
TOP VIEW

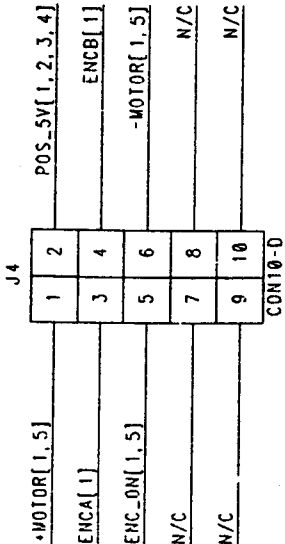


FIGURE B
TOP VIEW

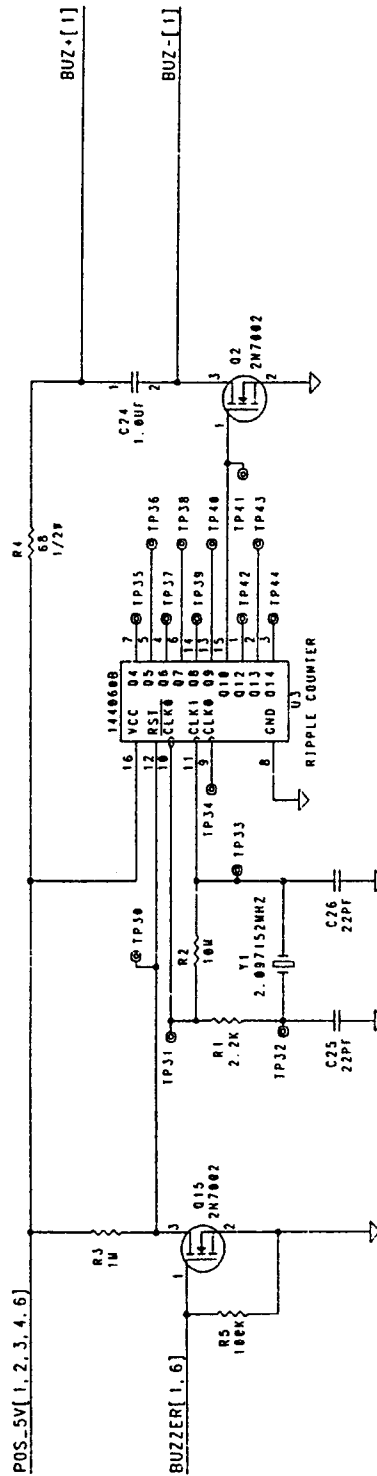
HIGHEST REF DESIGNATION

C208	CR201	DS1	F2	J12	K1	L13	LC1	Q204	R226	SW1	U205	TP45
REF DESIGNATION NOT USED												
C21-202	CR2-3											
C206	CR23-208											
C5												
C11												
C17												
C18												

TITLE		
SCHEMATIC, PCAT1 PUMP, MECHANISM BOARD, (FBS)		
SIZE	DRAWING NUMBER	REVISION
A	6470119	1
SCALE	FIRST USED ON	LOC SHEET
NONE		6 OF 7

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TITLE			
SCHEMATIC, PCA11 PUMP MECHANISM BOARD, BUZZER CIRCUIT			
SIZE	DRAWING NUMBER	REVISION	
A	6470119	1	
SCALE	FIRST USED ON	LOC	SHEET
NONE			7 OF 7

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16. C63, C64, L9, L10 & L11 ON PAGE 11 ARE TO BE PLACED AS CLOSE AS POSSIBLE TO J10.
15. C2, C3, C6, C9, C61, C62, L3, L7 & L8 ON PAGE 11 ARE TO BE PLACED AS CLOSE AS POSSIBLE TO J12.
14. CR10-13, C11, C14, C58, C59, CR7, R31, R32, R14, R2, R37 & R1 ON PAGE 11 ARE TO BE PLACED AS CLOSE AS POSSIBLE TO J14.
13. C56 ON PAGE 10 IS TO BE PLACED AS CLOSE AS POSSIBLE TO R29.
12. C55 ON PAGE 10 IS TO BE PLACED AS CLOSE AS POSSIBLE TO R27.
11. L6 & C54 ON PAGE 9 ARE TO BE PLACED AS CLOSE AS POSSIBLE TO U15.
10. C53 ON PAGE 8 IS TO BE PLACED AS CLOSE AS POSSIBLE TO U11.
9. C47 ON PAGE 7 IS TO BE PLACED AS CLOSE AS POSSIBLE TO R22.
8. L4, L5, C41 & C37 ON PAGE 6 ARE TO BE PLACED AS CLOSE AS POSSIBLE TO U3.
7. C18 ON PAGE 4 IS TO BE PLACED AS CLOSE AS POSSIBLE TO J15.
6. C57 ON PAGE 4 IS TO BE PLACED AS CLOSE AS POSSIBLE TO Q1.
5. C15, C16 & L2 ON PAGE 3 ARE TO BE PLACED AS CLOSE AS POSSIBLE TO U5.
4. DECOUPLING CAPACITORS SHOWN CONNECTED BETWEEN POWER AND GROUND ON SPECIFIED DEVICES AND CONNECTORS SHOULD BE PLACED AS CLOSE AS POSSIBLE TO EITHER THE POWER OR GROUND PIN.
3. [N] - A NUMBER ENCLOSED IN SQUARE BRACKETS INDICATES THE PAGE TO WHICH A SIGNAL CONNECTS.
2. <N> - A NUMBER ENCLOSED IN ANGLE BRACKETS INDICATES THE NUMBER OF WIRES IN A BUS.
1. UNLESS OTHERWISE SPECIFIED, ALL RESISTORS ARE MAXIMUM 1/4 W, MAXIMUM 5%. ALL RESISTANCE VALUES ARE IN OHMS.

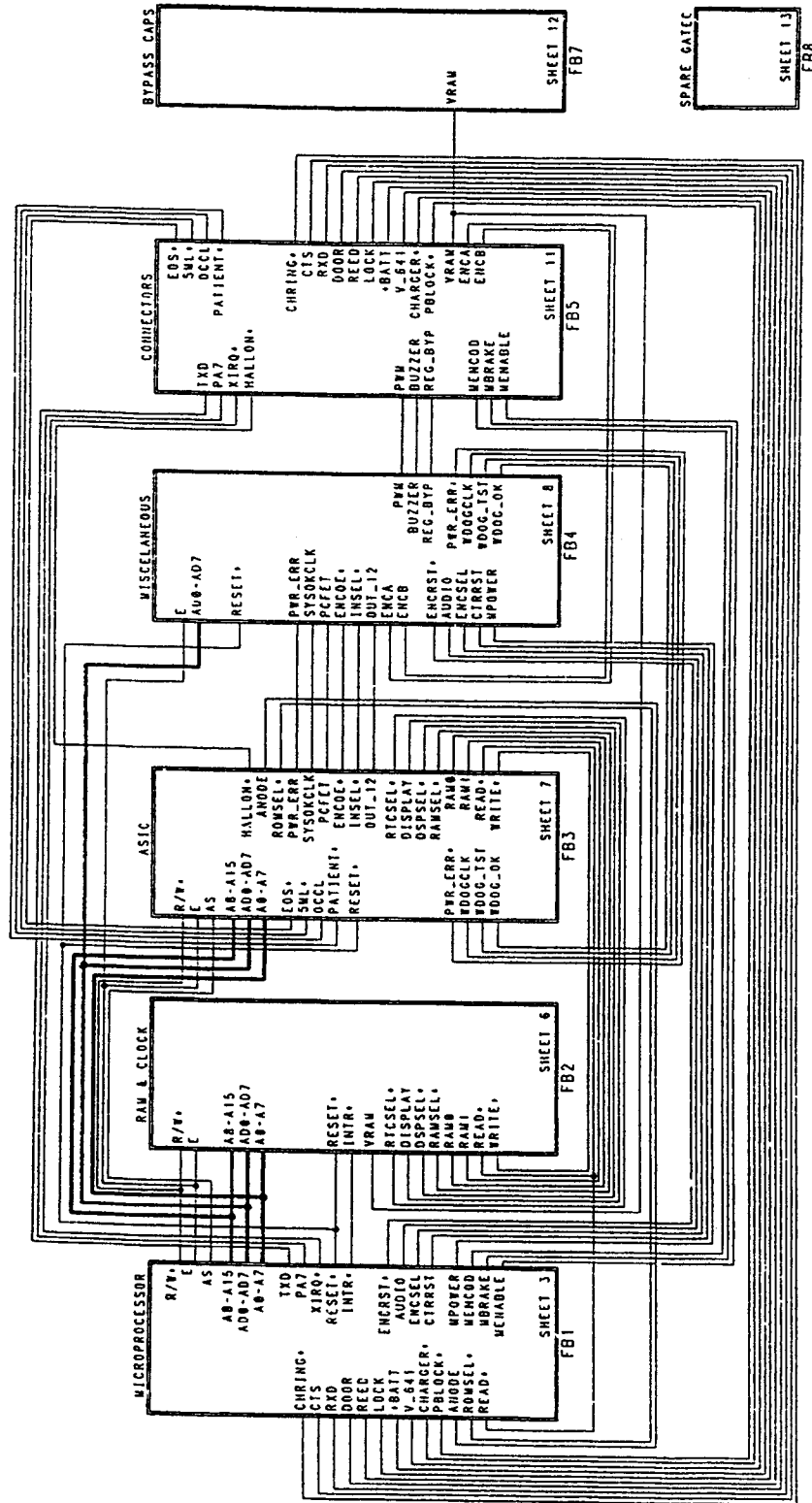
NOTES:

HIGHEST REF DESIGNATION											
C64	CR21	DS2	J17	L11	PD10	Q5	R37	RA15	T1	TP96	U27
REF DESIGNATION NOT USED											
			J1-8		PD3-4 PD7-8			RA4			U31-23 U25-26

TITLE			
SCHEMATIC, PCA11 PUMP, MPU BOARD, ESD			
SIZE	DRAWING NUMBER	REVISION	
A	6470128	1	
SCALE	FIRST USED ON	LOC	SHEET
NONE			1 OF 13

NOTICE - CONFIDENTIAL/PROPRIETARY INFORMATION

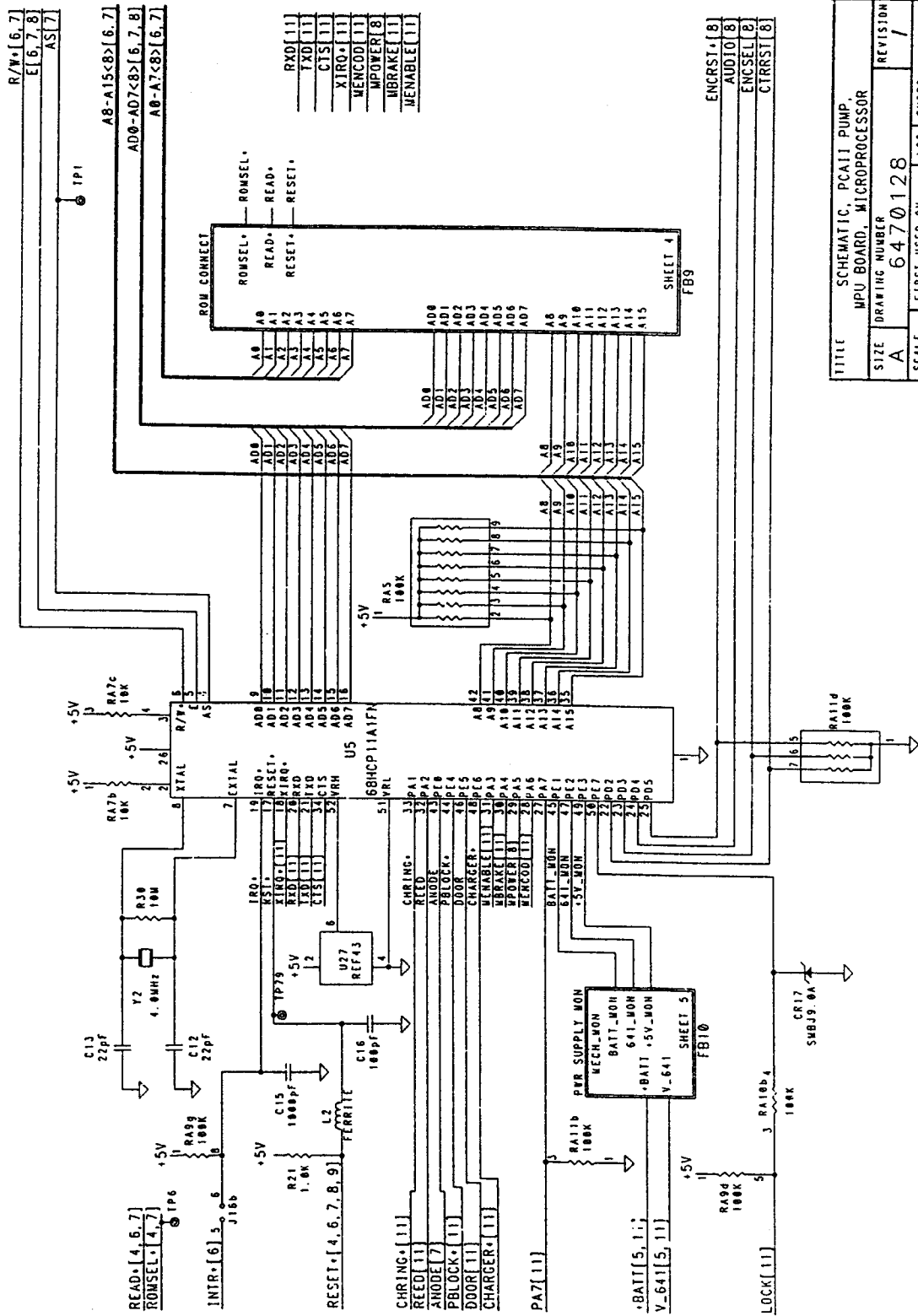
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TITLE			
SCHEMATIC, PCAII PUMP, MPU BOARD			
SIZE	DRAWING NUMBER	REVISION	
A	6470128	/	
SCALE	FIRST USED ON	LOC	SHEET
NONE			2 OF 13

NOTICE - CONFIDENTIAL/PROPRIETARY INFORMATION

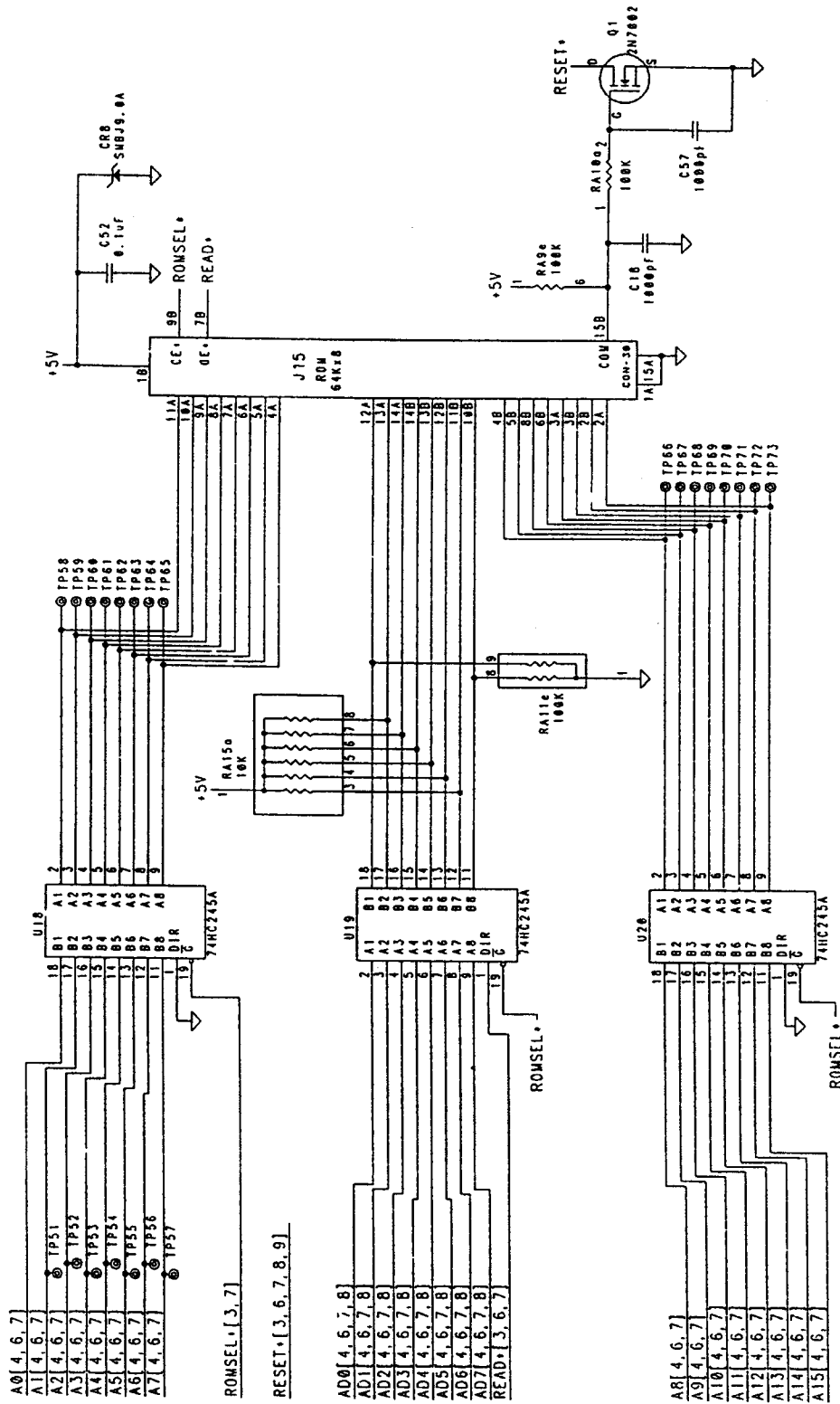
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TITLE				SCHEMATIC, PCA11 PUMP.			
				MPU BOARD, MICROPROCESSOR			
SIZE		DRAWING NUMBER		REVISION			
A		6470128		1			
SCALE		FIRST USED ON		LOC		SHEET	
NONE						3 OF 13	

NOTICE - CONFIDENTIAL/PROPRIETARY INFORMATION

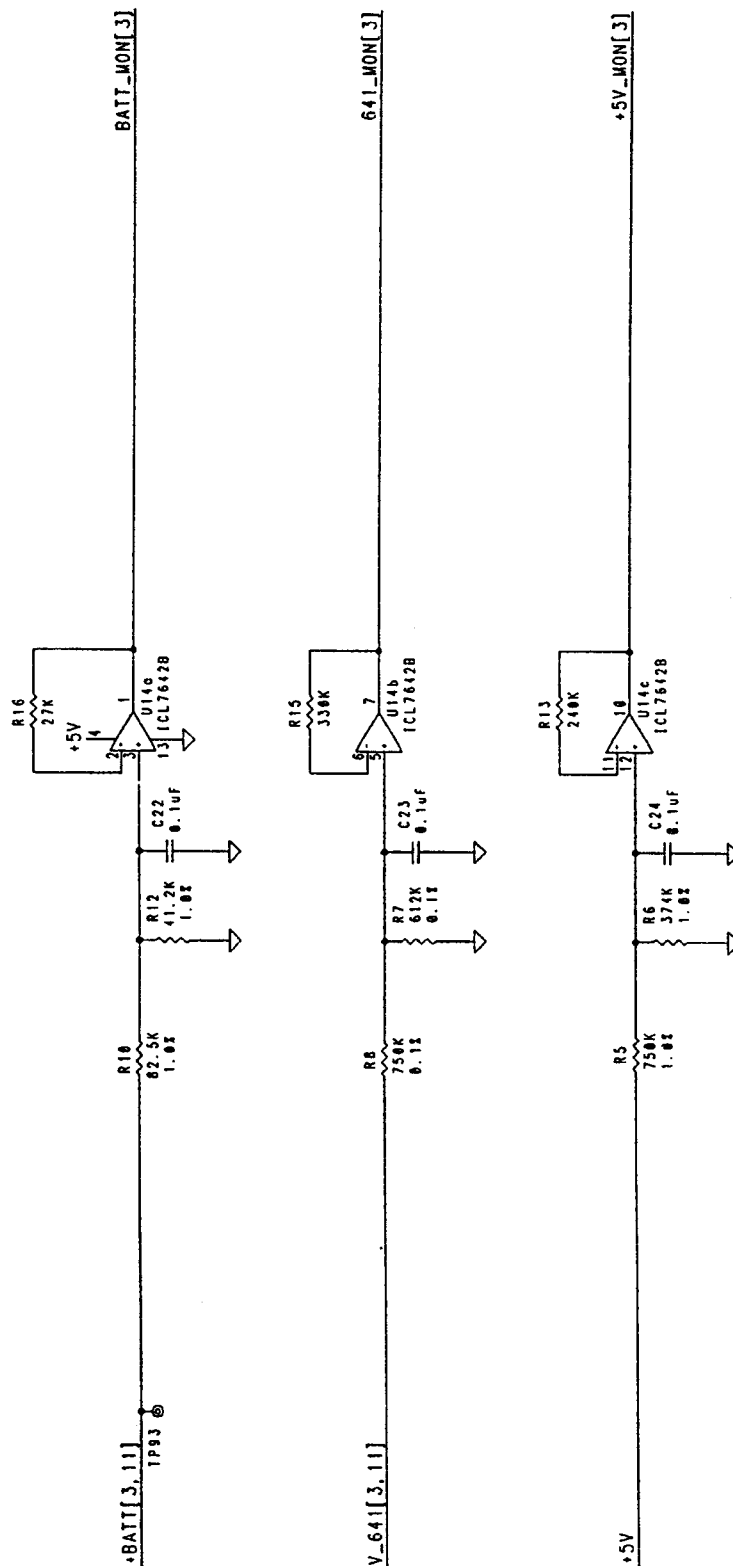
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TITLE SCHEMATIC, PC111 PUMP			
MPU BOARD, ROW CONNECTOR			
SIZE	DRAWING NUMBER	REVISION	
A	6470128	/	
SCALE	FIRST USED ON	LOC	SHEET
NONE			4 OF 13

NOTICE - CONFIDENTIAL/PROPRIETARY INFORMATION

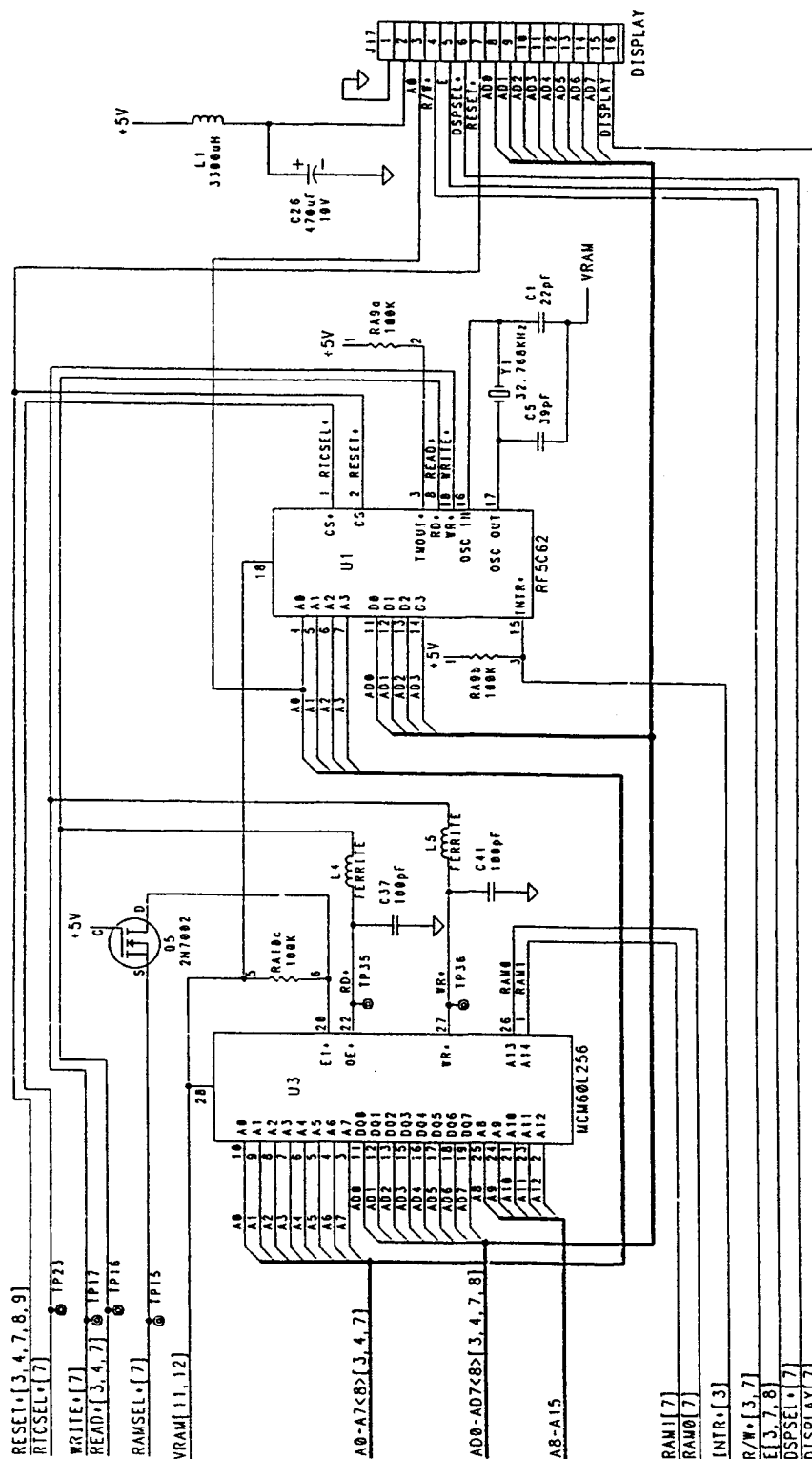
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TITLE SCHEMATIC, PCA11 PUMP,			
MPU BOARD, POWER SUPPLY MONITOR			
SIZE	DRAWING NUMBER	REVISION	
A	6470128	/	
SCALE	FIRST USED ON	LOC	SHEET
NONE			5 of 13

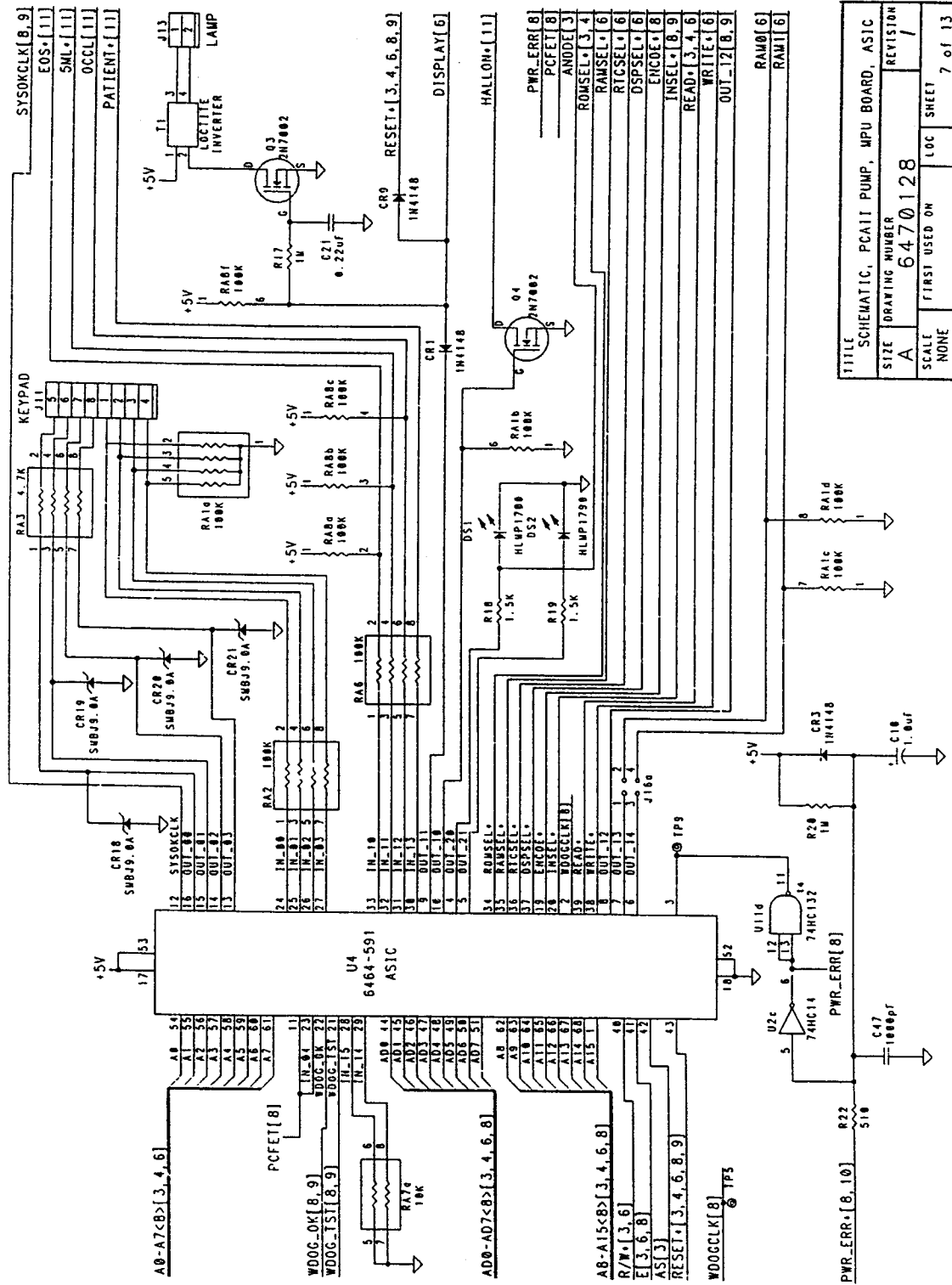
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TITLE SCHEMATIC, PCALL PUMP, MPU BOARD, RAM & REAL TIME CLOCK			
SIZE A	DRAWING NUMBER 6470128	REVISION 1	
SCALE NONE	FIRST USED ON	LOC	SHEET 6 OF 13

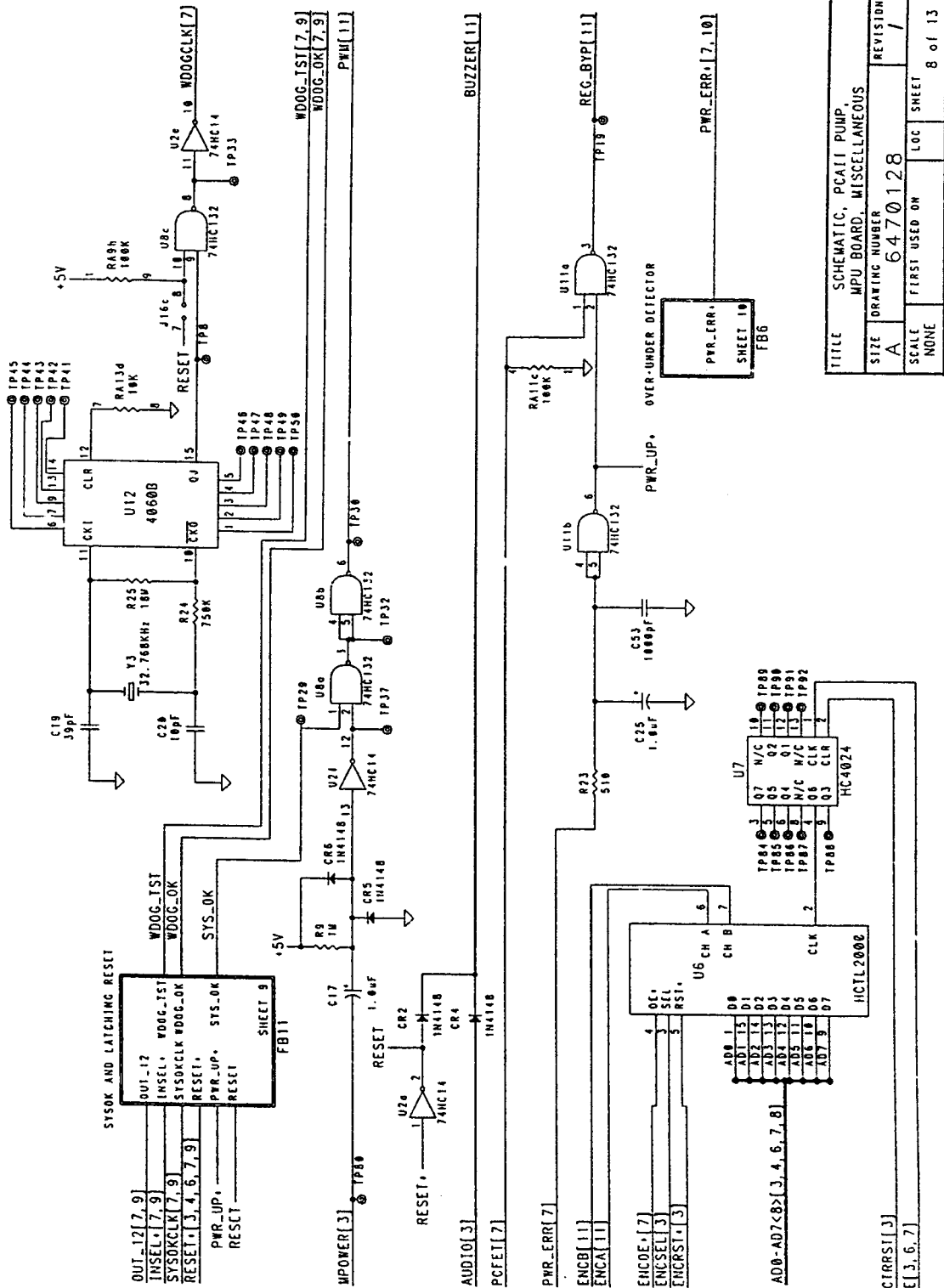
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TITLE		SCHEMATIC, PCAII PUMP, MPU BOARD, ASIC	
SIZE	DRAWING NUMBER	REVISION	
A	6470128	1	
SCALE	FIRST USED ON	LOC	SHEET
NONE			7 of 13

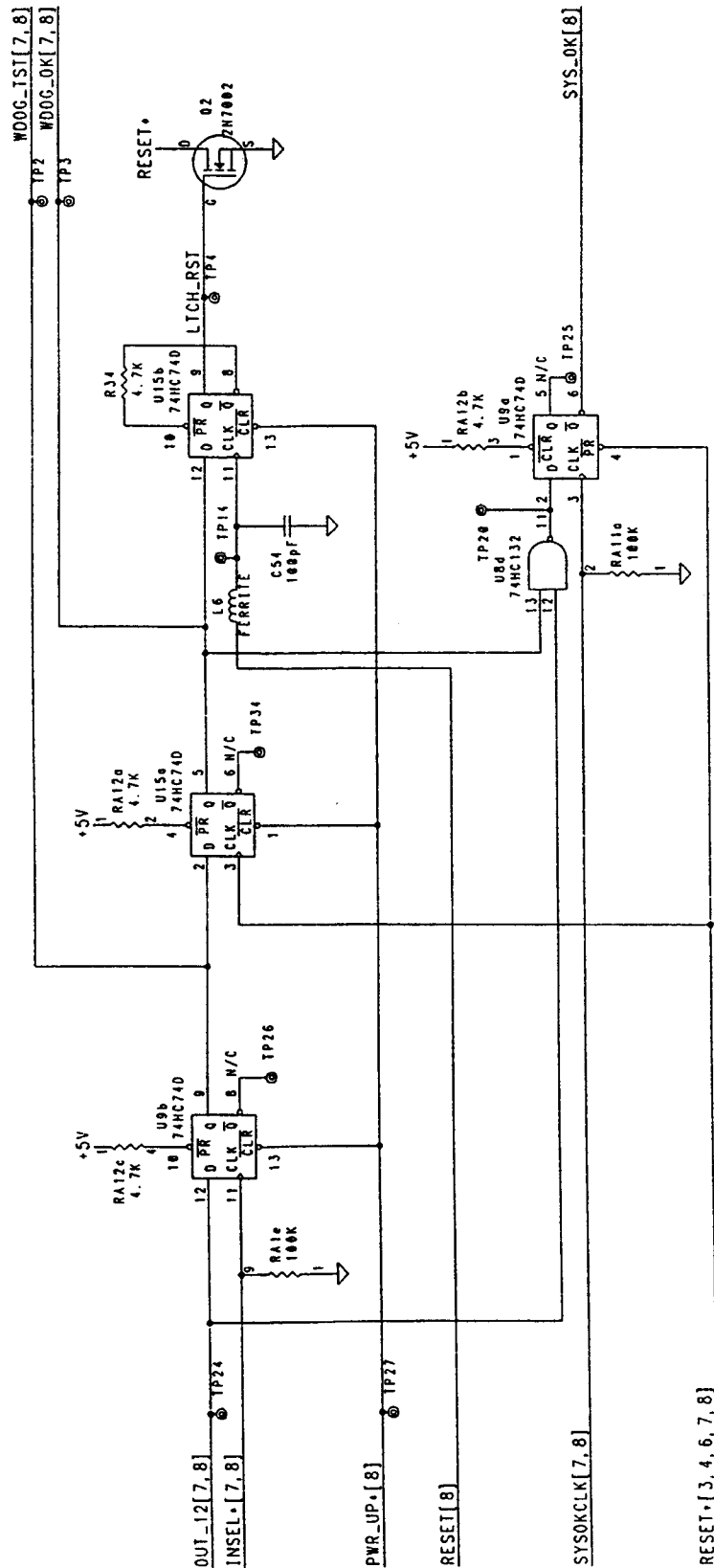
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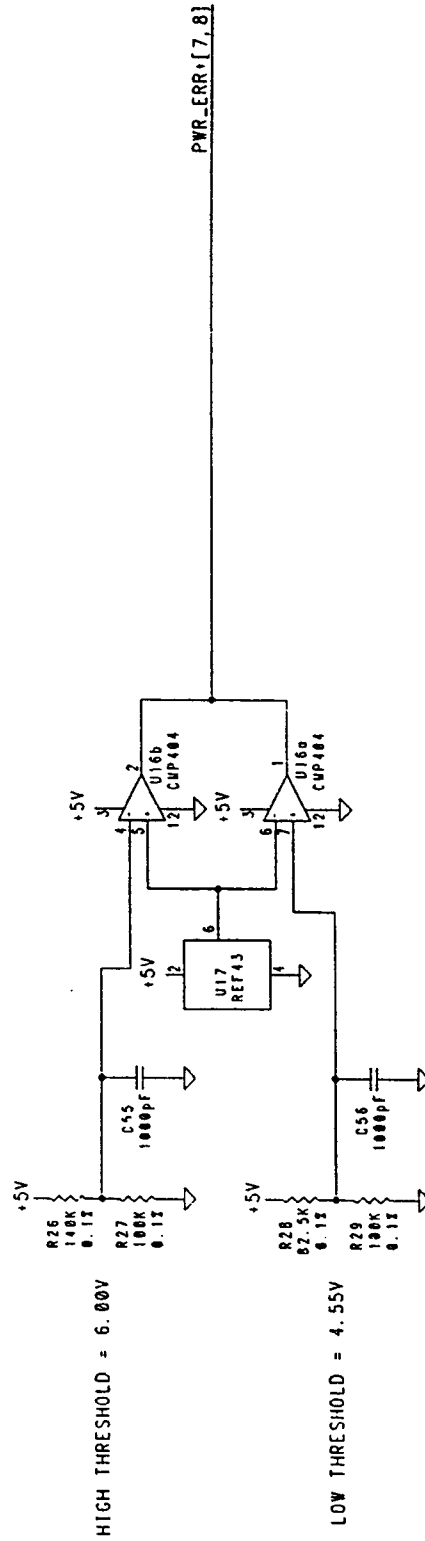
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TITLE SCHEMATIC, PCA11 PUMP.			
MPU BOARD, SYS_OK & LATCHING RESET			
SIZE	DRAWING NUMBER	REVISION	
A	6470128	/	
SCALE	FIRST USED ON	LOC	SHEET
NONE			9 of 13

NOTICE - CONFIDENTIAL/PROPRIETARY INFORMATION

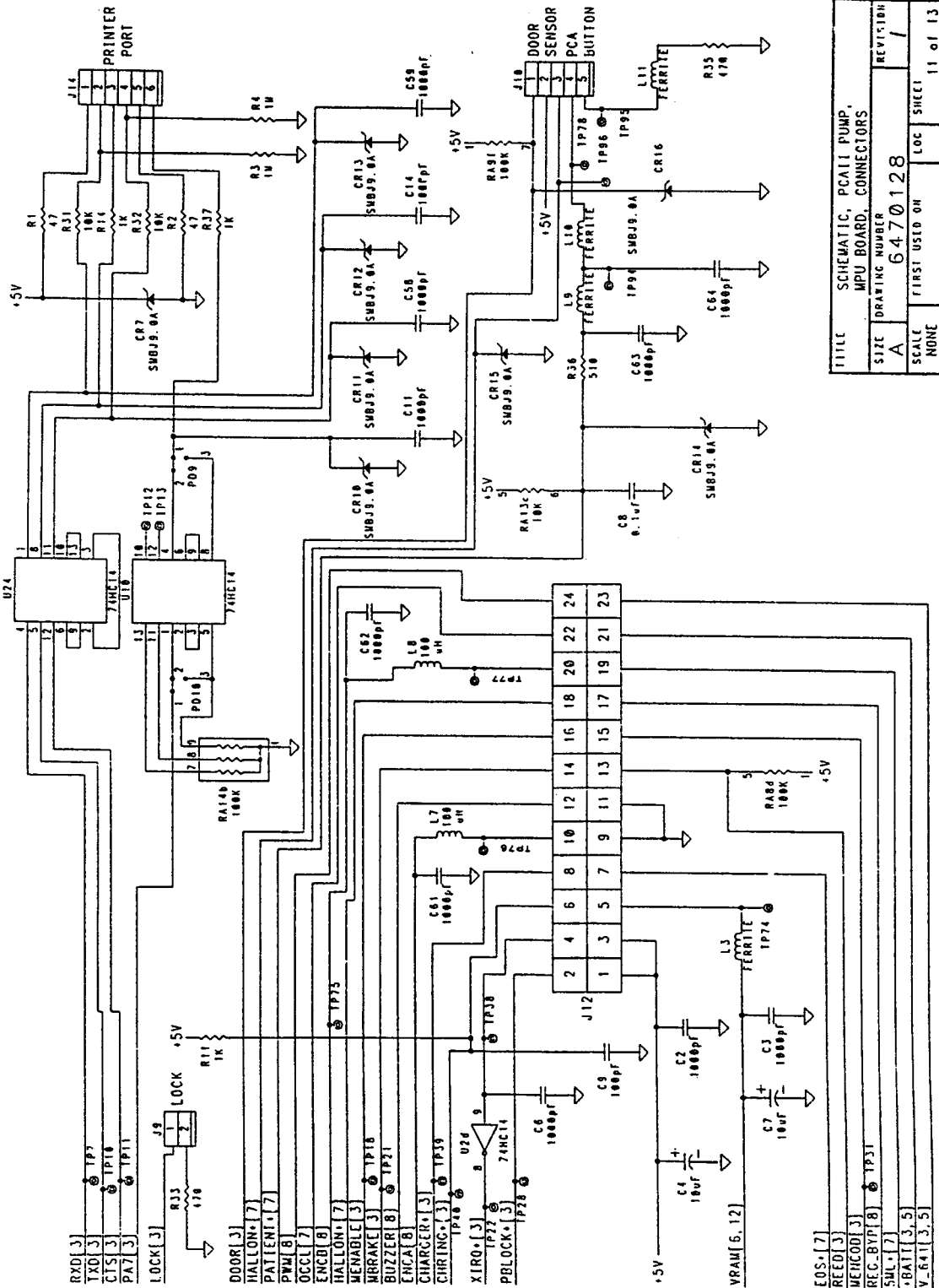
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TITLE SCHEMATIC, PCA11 PUMP,			
MPU BOARD, OVER-UNDER DETECTOR			
SIZE	DRAWING NUMBER	REVISION	
A	6470128	1	
SCALE	FIRST USED ON	LOC	SHEET
NONE			10 of 13

NOTICE - CONFIDENTIAL/PROPRIETARY INFORMATION

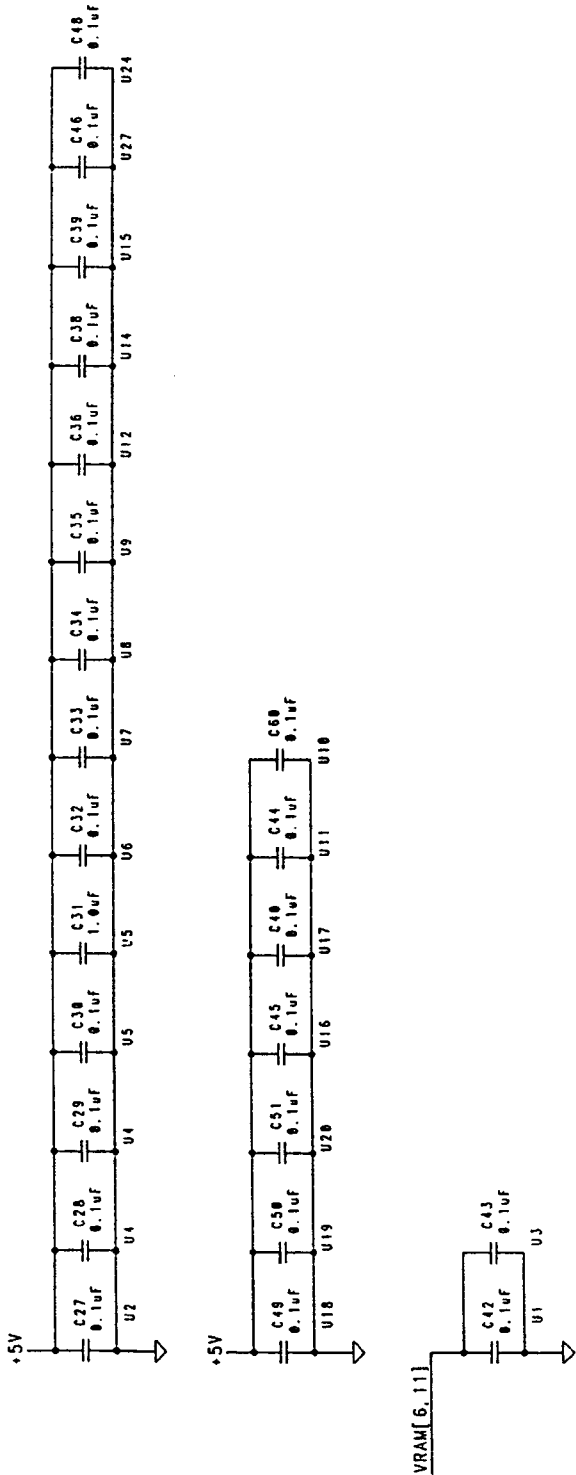
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TITLE			
SCHEMATIC, PCA11 PUMP, MPU BOARD, CONNECTORS			
SIZE	DRAWING NUMBER	REVISION	
A	6470128	1	
SCALE	FIRST USED ON	LOC	SHEET
NONE			11 of 13

NOTICE - CONFIDENTIAL/PROPRIETARY INFORMATION

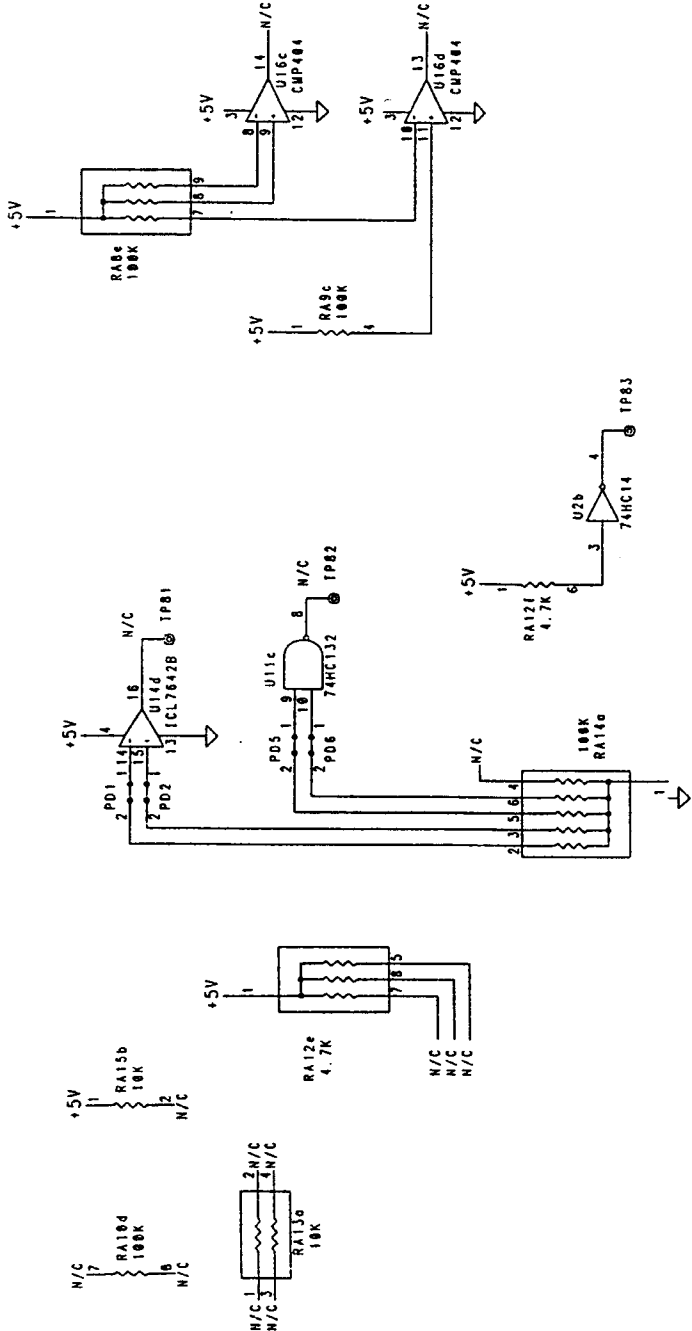
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TITLE SCHEMATIC, PCAT11 PUMP, MPU BOARD, BYPASS CAPS			
SIZE A	DRAWING NUMBER 6470128	REVISION 1	
SCALE NONE	FIRST USED ON LOC	SHEET 12 of 13	

NOTICE - CONFIDENTIAL/PROPRIETARY INFORMATION

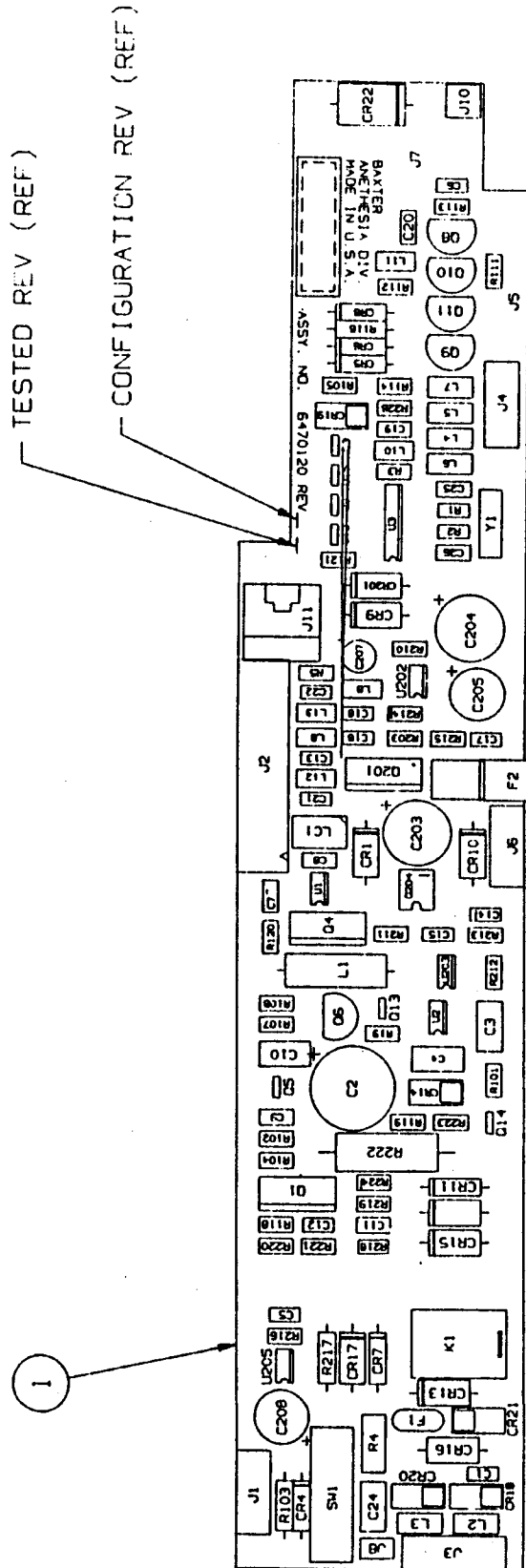
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TITLE				SCHEMATIC, PCA11 PUMP, MPU BOARD, SPARE GATES			
SIZE		DRAWING NUMBER		REVISION			
A		6470128		/			
SCALE		FIRST USED ON		LOC		SHEET	
NONE						13 of 13	

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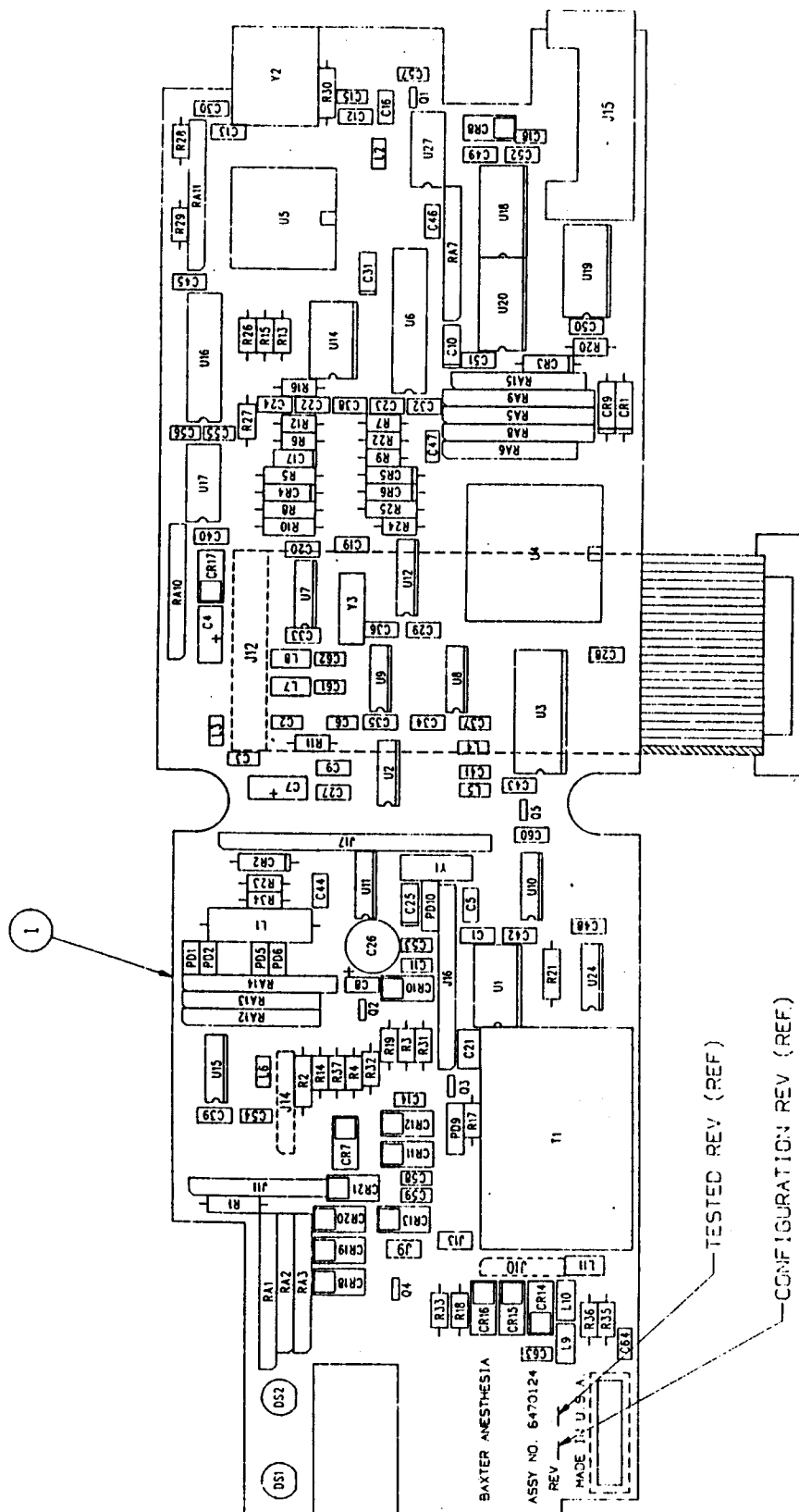
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TITLE		ASSY. PCB MECHANISM ESD PCA II	
SIZE	DRAWING NUMBER	6470120	REVISION
C			2
SCALE	FIRST USED ON	LOC	SHEET OF
1.5:1	6464933		1 1

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Revision	Date	General Description of Changes
0	11/91	NEW DOCUMENT RELEASE
1	6/93	Circuit Redesign
2	2/94	Division Logo Change
3	1/95	Updated to include Assembly/Disassembly, Troubleshooting, and Parts List. Updated to include Hardware Revision 4.4 (Product Update APPD1)

